ROWE®

BC-150
Bill Changer

Field Service Manual
and
Parts Catalog

PART NO. 25238806
SECOND EDITION

WARNING:

This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instructions manual, may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference in which case the user at his own expense will be required to take whatever measures may be required to correct the interference.

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Rowe extends the original operator of this equipment the following warranty:

All parts are guaranteed to be free of defects in material and workmanship for the specific periods which follow. Rowe agrees to repair without charge during such period any part which proves defective upon examination by Rowe. All costs of shipping an allegedly defective part to Rowe's offices shall be borne by the original operator. Rowe will pay the shipping costs for the replacement of defective parts

Coin Hoppers	5 Years From Date of Purchase
Electrical Circuit Boards	1 Year From Date of Purchase
Electrical and Mechanical Parts	1 Year From Date of Purchase
Lamps	90 Days From Date of Purchase

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Product Purchased From_____

Please complete the following:	Excellent	Good	Fair
This products performance when first powered up was:	___	___	___
The overall quality of this product was:	___	___	___
The distributor suppport for this product was:	___	___	___
The operation manual and instructions are:	___	___	___

If there are any suggested product improvements or if problems are encountered during installation and/or set up, please advise in the space provided below.

_____

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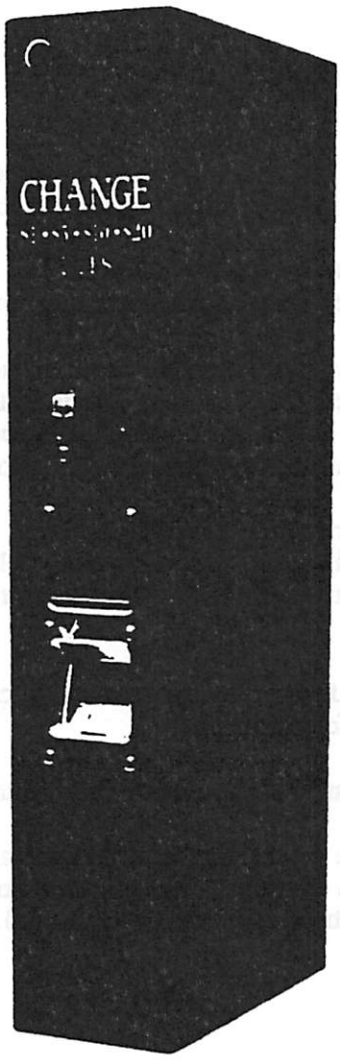
BC-150
Bill Changer

Field Service Manual
and
Parts Catalog



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FORWARD

This service manual is divided into six sections:

- **Section 1** **System Description** — Introduces you to the BC-150, its features, and its major components, principles of operation, and capacities
- **Section 2** **Installation And Programming** — Guides you through step-by-step installation instructions and detailed setup (programming) procedures.
- **Section 3** **Routine Service** — Provides routine service instructions for general maintenance and preventive maintenance. This section provides information for routine service and identified problems. *Refer to Section 4, Troubleshooting,* for procedures and techniques to identify a malfunction or reject problem.
- **Section 4** **Troubleshooting** — Provides troubleshooting charts, detailed error message descriptions, troubleshooting procedures, a block diagram, schematics, circuit board layouts, and component lists. This section also contains a detailed sequence of operation.
- **Section 5** **Miscellaneous** — Contains a resistor color code chart, a harness color code list, and other miscellaneous information.
- **Section 6** **The Parts Catalog** — Lists and illustrates all replaceable modules in the BC-150.

This manual is intended for owners, route operators, and technicians. This manual provides all field and shop related service and maintenance material. Accessories and their installation and service are discussed in the corresponding accessory instructions (or manuals).

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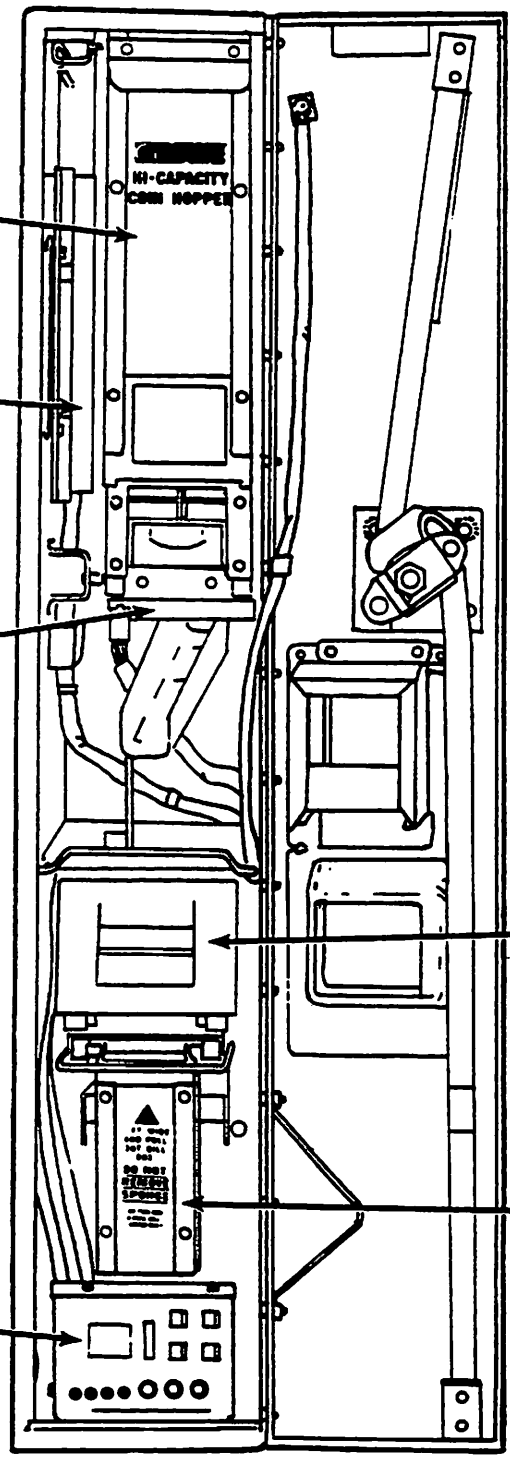
Coin Hopper -
Holds Quarters, SBA $1 Coins or tokens. An optional hopper can be used for nickels or dimes.

Computer Control Center (CCC) -
Controls validation and change making functions. Also contains the status display, the function switches (keys) and the PROGRAM/NORMAL switch.

Coin Dispenser
(behind hopper) -
Contains drive motor and coin counting photocell, for dispensing change.



Bill Transport -
Receives the bill that is inserted by the customer and moves the bill into the machine. Contains sensors which are used to determine the validity and denomination of the bill. If the bill is determined to be valid, it is delivered to the stacker—otherwise, it is returned to the customer.

Bill Stacker -
Receives and stacks bills into bill box.

Power Control Center -
Contains the dollars accepted counter, circuit breakers, on/off switch, step-down transformer, power relay, voltage regulator, and power supply circuit board.

Figure 1-1. BC-150 Major Components

Section 1: System Description

INTRODUCTION

The Rowe BC-150 Bill Changer is specially designed for casinos. It uses the same computer and money changer technology used in our other changer models, which combines Rowe quality and reliability with maximum flexibility and ease of installation and service.

The BC-150 accepts and dispenses change for combinations of 1, 2, 5, 10, and 20 dollar bills of United States currency. Denominations can be programmed to be accepted in any combination, as can the choice of coins paid out.

- A microcomputer in the bill Changer Control Computer (CCC) selectively discriminates between denominations, provides protection against bogus bills and controls the change dispensing functions.
- Plug-in circuits and assemblies are featured for fast field substitution.
- Coin combination and acceptable denomination programming is easily changed using the FUNCTION, UP, DOWN, VALUE and HOPPER pushbutton switches.
- The removable coin hopper permits rapid bulk loading of coins.
- During setup, a special payout check feature ensures that the payout amount selected matches the denomination accepted.
- Optional coin control may be programmed to monitor the number of coins left in the changer, which prevents shortages to the customer.

Refer to *figure 1-1* for the locations of the major BC-150 components.

GENERAL OPERATION

The entire validation and payout sequence is controlled by a microcomputer to ensure the maximum security against bogus currency and jackpotting. *Refer to the Detailed Computer Board Operation in Section 4* for a complete explanation of how the machine works.

Changing A Bill

Inserting a dollar bill in the transport starts a motor which moves the bill along the acceptor track. While in motion, the bill is examined to determine whether or not it is valid (during this time, the message VALIDATING will appear on the computer's display).

If the bill is valid, a vend signal is transmitted to the dispenser and the bill drops into the bill stacker where it is stacked flat against other valid bills. At this time, the message PAY $1 (for example) for a $1 bill will appear on the display.

The coin hopper motor then operates, dropping the correct number of coins from the coin hopper into the coin cup.

If the bill is determined to be invalid, the bill transport motor reverses, returning the bill to the customer.

FUNCTIONAL DESCRIPTION

This functional description can be used to gain an overall understanding of the BC-150 and its operation.

Bill Transport

The bill transport *(see figures 1-2 and 1-3)* receives a bill as it is inserted by the customer. The bill is transported through the transport on a belt system, carefully examined and, if the bill is determined to be valid, is delivered to the bill stacker.

If the bill fails any of the validation tests, the transport reverses and returns the bill to the customer. The bill will hang in the transport inlet for a period of five seconds during which time the CCC will display a message explaining the cause for the rejection.

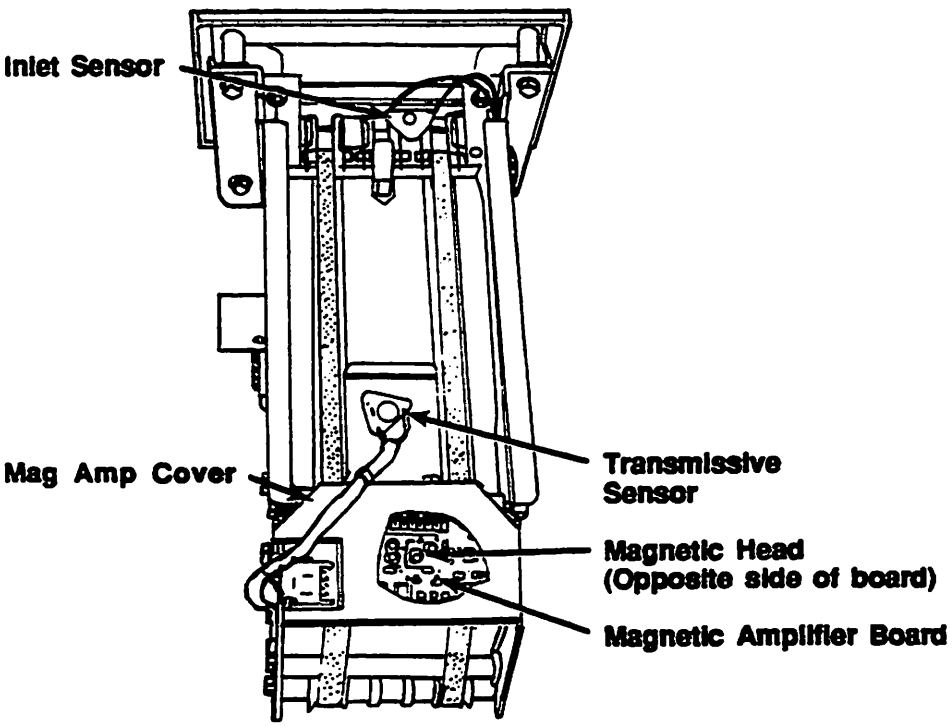


Figure 1-2. Bill Transport - Top View

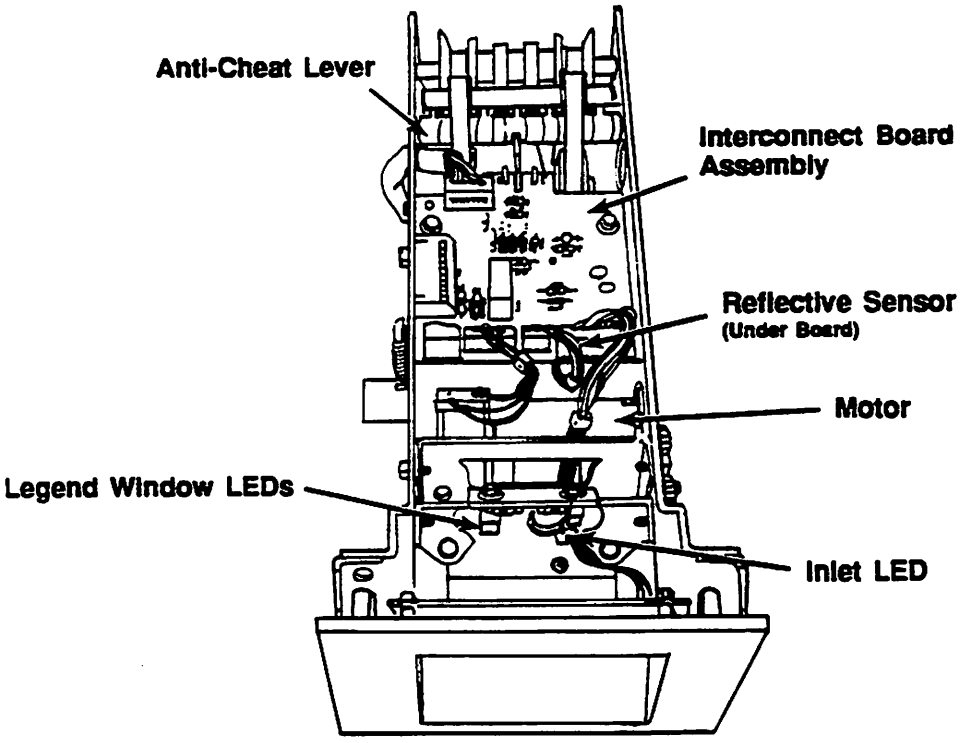


Figure 1-3. Bill Transport - Bottom View

Bill Stacker

The bill stacker, shown in *figure 1-4*, accepts the validated bills from the bill transport and stacks them, one at a time, in a removable slide-out box.

After the bill exits the transport and falls into the stacker, a signal from the control computer center energizes the drive circuit inside the stacker and relay K501 is pulled in, completing a circuit to the 115 VAC bill stacker motor. The signal from the control computer center is not long enough to drive the stacker a full cycle, so a set of contacts of K501 is used to hold in the coil. As the stacker leaves HOME position, cam switch S501 closes, followed closely by the switching of cam switch S502. Switch S502 grounds a line back to the control

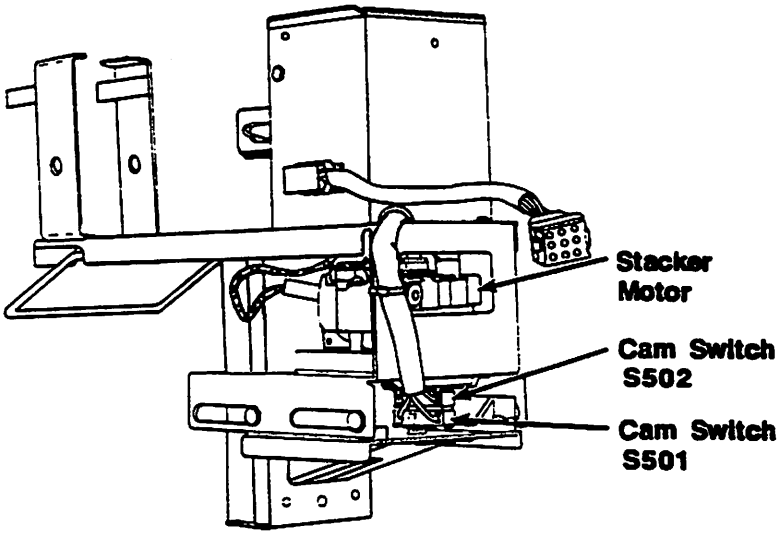


Figure 1-4. Single Stacker

computer, which prevents the acceptance of bills and disables the machine if the stacker fails to complete its cycle. About ½ second into the cycle, K501 drops out and the stacker motor operates through switch S501 only. As the stacker completes a cycle, cam switch S502 switches back and cam switch S501 opens, stopping the stacker motor. The stacker is now ready for another cycle.

Dispenser

The dispenser *(see figure 1-5)*, contains the necessary components to handle the coins.

The coin detector, consisting of an LED and a photo-transistor, detect the coins as they exit from the hopper and fall into the upper coin chute. The upper coin chute directs the change to the lower coin chute and then to the coin cup.

The drive for the hopper consists of an AC motor, which is also on the dispenser. This motor is controlled by signals from the CCC.

You can access the rear of the dispenser assembly by removing the screw in the upper right corner, grasping the dispenser at the top, and tilting the entire assembly forward on its lower pivots.

When you replace the dispenser, be sure that you tighten down the top screw securely. If this screw is not tightened down, the entire dispenser assembly may tilt forward while loading, unloading, or removing the hopper.

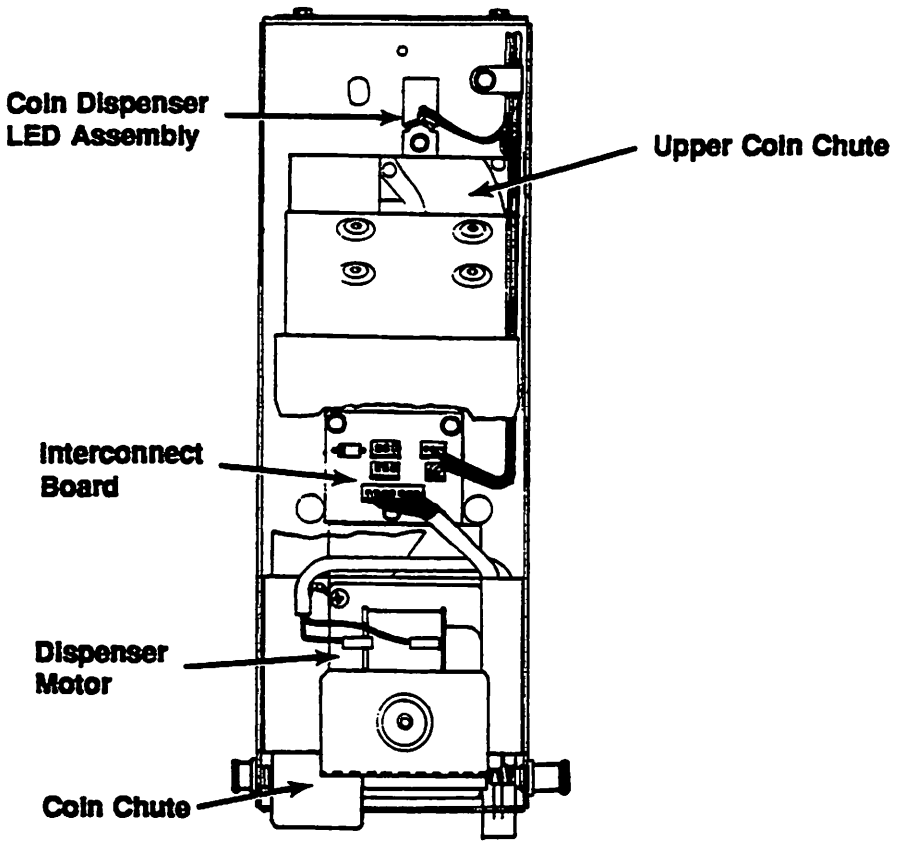


Figure 1-5. Coin Dispenser (Rear View)

Hopper

The bill changer contains one coin hopper *(see figure 1-6)*, which mounts on the front surface of the dispenser assembly and pivots forward from the bottom for loading, unloading, and removal *(see table 1-2 for required hopper types and capacities)*.

The hopper transports coins to the coin detector and the upper coin chute by means of a chain conveyor, which is driven from below by a sprocket. The chain follows a serpentine path, so that excess coins fall back into the hopper ensuring only one coin per pin enters the coin counting area.

The chain picks up coins from the bottom of the hopper and carries them up to the top, where they fall through the upper chain guide ring and interrupt a light beam to a photo-detector, which is mounted on the dispenser. The required number of coins for a desired change combination are counted in this manner as the coins then fall through a closed chute to the coin cup.

An agitator, which is mounted on the drive shaft in each hopper, agitates the coin load to minimize coin jams in the hopper and ensure efficient coin pick up.

To reduce jams and minimize the need for cleaning, the hopper has Teflon coated coin tracks.

Table 1-2. Machine Capabilities

Hopper Capacities		
Hopper	**Popular Coin Capacities**	
65027608 Small Coin .705 to .955 inch diameter	Dimes Nickels Quarters	8,000 4,000 3,400
65027609 Large coin/Token .875 to 1.125 inch diameter	Quarters SBA Dollars .984 inch Tokens	3,200 2,200 3,000
Machine Capacities		
Bill Stacker	1,000 bills in bill box	

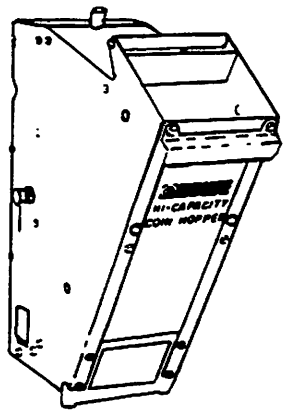


Figure 1-6. Coin Hopper

Temporarily Out Of Service Lamp

This lamp is located on the door above the bill inlet area. It lights whenever the machine is empty of change or shutdown due to some malfunction. Press the FUNCTION key on the CCC to turn the OUT OF SERVICE light off after the machine has been reloaded or if the malfunction has been repaired.

EMI Filter

The ElectroMagnetic Interference (EMI) filter removes undesirable electrical noise from the incoming power line. The power transformer supplies 36 VAC and 22 VAC from which the rest of the system voltages are derived.

Power Control Center

All power supply components and associated circuitry are located in this single subassembly for easy diagnosis and repair. The power control center *(see figure 1-7)* is located below the bill stacker and contains the dollars accepted counter, TEST VEND switches, power transformer, power supply circuit board, circuit breakers, and ON-OFF switch.

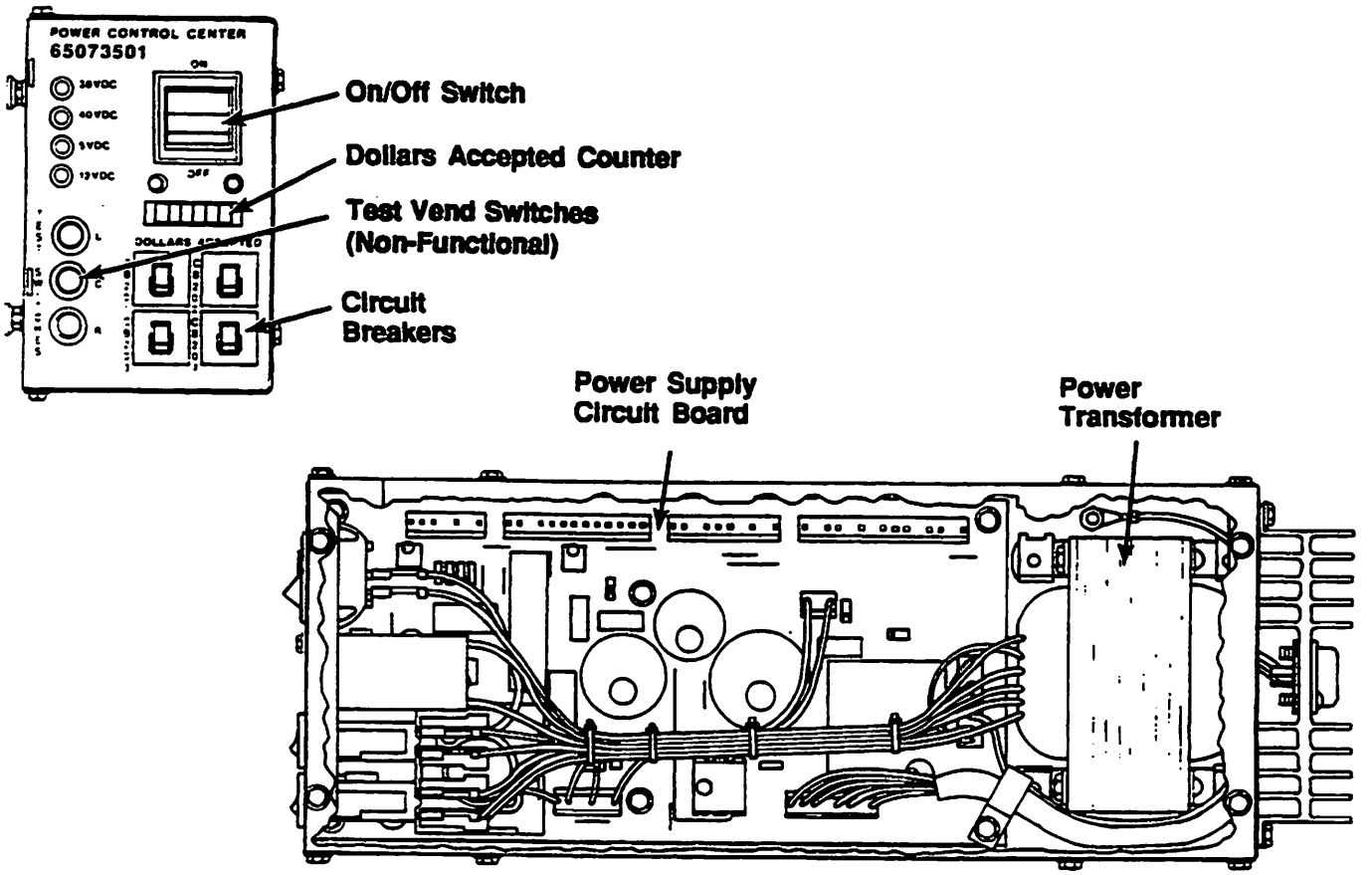


Figure 1-7. Power Control Center

DOLLARS ACCEPTED COUNTER

The dollars accepted counter registers the number of dollars accepted by the machine. The counter increments once for each dollar (for example: A $5 bill will make the counter increment five times). This counter is not resettable.

POWER SUPPLY

The ON-OFF switch controls power to the machine.

A 7-amp circuit breaker is in the power line to the bill changer. The power transformer is protected by a 2-amp circuit breaker in the primary winding. A 7-amp and a 5-amp circuit breaker protect the secondary windings.

The power supply circuit board rectifies and filters the 36 VAC and 22 VAC to provide 40 VDC, 30 VDC (current limited) 12 VDC, 8 VDC, and 5 VDC to the rest of the system. It contains indicator LED's for the 40 VDC, 30 VDC, 12 VDC, and 5 VDC supplies.

This changer will shutdown for reasons other than being empty, specifically, if a fault or malfunction of the machine occurs. When the changer shuts down, a message will appear on the display located on the computer board. This message will aid the serviceman in quickly determining the malfunction or faulty part *(see Section 4, Troubleshooting)*.

TEST SWITCHES

The TEST switches are non-functional in the BC-150.

POWER CONTROL RELAY

The power control relay switches the 40 VDC, 30 VDC, and 120 VAC. This relay is controlled by the CCC and is energized under normal operating conditions. Under certain conditions the CCC de-energizes the relay to disconnect the previously mentioned voltages from the rest of the system and shut down the machine. In this condition, the +40 VDC LED on the power supply board will be OFF while the other three remain ON.

Changer Control Computer

The Changer Control Computer (referred to as the "CCC" and *shown in figure 1-8)* directs all of the operations of the bill changer including both the validation and change dispensing functions. It contains a microcomputer, which controls all of the major functions of the bill changer. It also contains the following controls and displays:

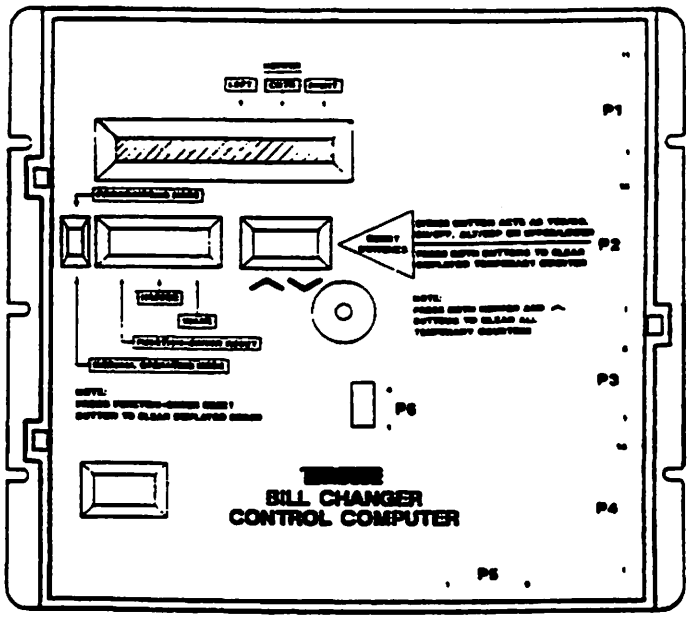


Figure 1-8. Changer Control Computer (CCC)

STATUS DISPLAY

The CCC contains many programming and self-diagnostic features which are described in the paragraphs that follow. All messages are shown on a 16-character vacuum fluorescent display. In some cases, the message is short enough so that the word(s) can be spelled out; in other cases the word(s) are abbreviated. The abbreviations are clear and logical and each message is described in *Section 4* of this manual.

SERVICE AND CONTROL SWITCHES

The BC-150 Bill Changer's service features and programming options are controlled by six switches. The descriptions that follow are introductory; *follow the detailed procedures and instructions in Section 2* for specific operating and programming information.

Programming/Normal

Selects either the NORMAL operating mode or the PROGRAMMING mode.

NORMAL POSITION

In the NORMAL mode position, the changer operates in a normal manner. The CCC monitors all systems for faults or customer input.

Three of the pushbutton switches provide unique features while the machine is in the NORMAL mode.

Function Pushbutton

Pressing the FUNCTION button makes the display access the coin control features when the COIN CONTROL option is enabled (see *Coin Control* in this section for a detailed explanation of the COIN CONTROL feature).

Value Pushbutton

Pressing the VALUE pushbutton will cause the display to show the total dollar amount accepted since this temporary audit value was cleared. Thus, if you clear this audit counter each time you load the hopper, you can quickly spot check to see how much change has been paid out and thus determine whether or not the bill changer needs to be loaded again.

Hopper Pushbutton

Pressing the HOPPER pushbutton will cause the display to show the last three denominations accepted. The most recent denomination is displayed on the left side, the bill before that is displayed in the center, and the earliest of the three bill denominations is displayed on the right side.

PROGRAMMING POSITION

Setting the mode to PROGRAMMING position allows you to inspect and/or change the audit and setup information. This information is displayed on the status display and is selected and changed by using the five push buttons that are described in the following paragraphs.

Function Pushbutton

Advances from the current set of options to the next set. The following list shows the sequence of options that will be displayed as the FUNCTION pushbutton is pressed repeatedly:

1. TEMP COUNTERS
2. PERM COUNTERS
3. PROGRAMMING
4. HOP VAL
5. ACCEPT
6. PAYOUT
7. COIN CONTROL

If the FUNCTION pushbutton is pressed while COIN CONTROL is showing, the TEMP COUNTERS display will reappear.

Hopper Pushbutton

In the PROGRAMMING mode, this pushbutton is only used to program a new access code.

Value Pushbutton

During the programming mode, this pushbutton is used to move between various values; i.e. the value of coins in the hopper.

Up (^) And Down (v) Pushbuttons

Increment or decrement the displayed option value. Options that have only two possibilities, such as ON and OFF, are toggled between the two options using either of these pushbuttons.

DENOMINATIONS ACCEPTED

The BC-150 can accept 1, 2, 5, 10, and 20 dollar bills of United States currency. All of these denominations can be selected in combination with other denominations.

COIN CONTROL

In other models of Rowe bill changers, an escrow bucket system is used. That system guarantees correct change payout by counting the coins before a payout is required. The BC-150 is different because it pays change directly from the hopper to the customer. This is necessary to allow $1, $2, $5, $10, and $20 bills to be changed and still keep the BC-150 small.

In order to prevent a customer from being short-changed, the BC-150 keeps track of the number of coins left in the hopper. The BC-150 will shutdown when this number is not enough to guarantee a proper payout.

The error message LOW HOPPER LEVEL indicates that the machine is out of service because there are not enough coins left in the hopper for a payout of the highest allowed denomination.

Coin Control Functions

The coin control system has four functions:

- Enabling the coin control option
- Setting the amount of money loaded into the hopper
- Maintaining the amount of money in the hopper
- Keeping track of money paid out

Programming and operation of this system is fully described in *Section 2.*

Section 2: Installation & Programming

INSTALLATION

Installing the BC-150 Bill Changer requires no special instruction. For all types of installation, be sure that a power source is convenient and that the changer is mounted level.

BC-150 MOUNTING TECHNIQUES

The BC-150 can be mounted on the floor, a wall, a shelf, a table, or on a slide base for a casino style mount. To install the BC-150 with the slide mount, order Kit 27039701.

NOTE:

For both security and safety reasons, Rowe strongly recommends that this bill changer be securely anchored to the floor, table, shelf, or wall. Please check the instructions that follow:

Mounting The BC-150 On A Wall

The following illustrations and procedures should be used for wall mounting. For concrete or masonry wall mounting, use lag screws and lead anchors. For wood frame wall mounting, use lag screws attached directly to the wall studs. If the wall is not flat, you may need to add spacer washers between the wall and the mounting plate.

If changer is rigidly mounted to the wall, make the power input connection through rigid conduit into the changer to meet U.L. requirements *(see figure 2-1)*.

NOTE:

If you are wall mounting the bill changer and drilling holes in it, be sure to remove all metal filings from inside the bill changer before putting the changer into service.

Mounting The BC-150 On A Table Or Shelf

Use the four 1/2-inch holes in the bottom of the BC-150 as a drilling guide and drill four 3/8-to-1/2 inch holes. Secure the BC-150 to a sturdy table or shelf with four 3/8-to-1/2 inch bolts.

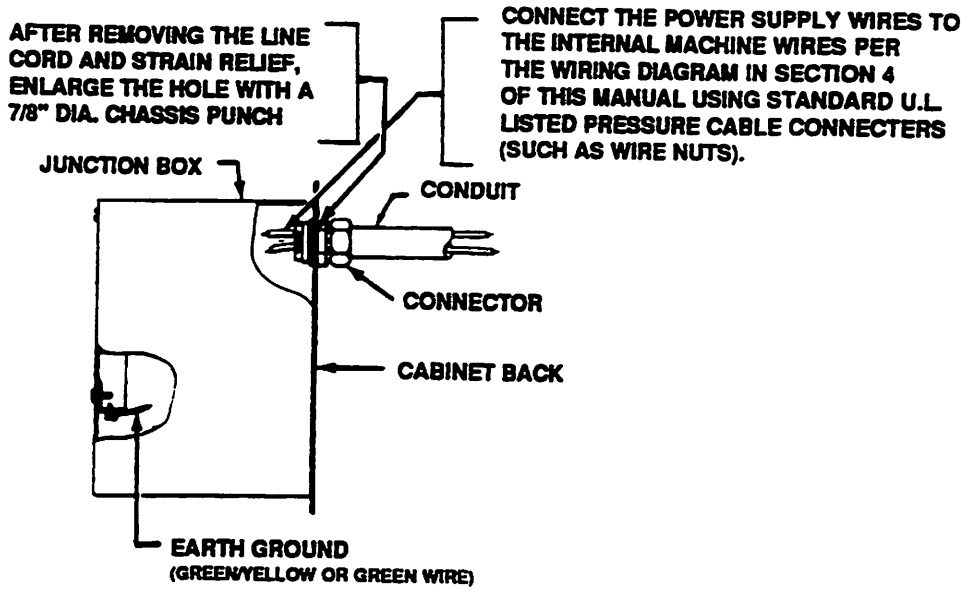

AFTER REMOVING THE LINE CORD AND STRAIN RELIEF, ENLARGE THE HOLE WITH A 7/8" DIA. CHASSIS PUNCH
CONNECT THE POWER SUPPLY WIRES TO THE INTERNAL MACHINE WIRES PER THE WIRING DIAGRAM IN SECTION 4 OF THIS MANUAL USING STANDARD U.L. LISTED PRESSURE CABLE CONNECTERS (SUCH AS WIRE NUTS).
JUNCTION BOX
CONDUIT
CONNECTOR
CABINET BACK
EARTH GROUND
(GREEN/YELLOW OR GREEN WIRE)

Figure 2-1. Installing 1/2 Inch Conduit

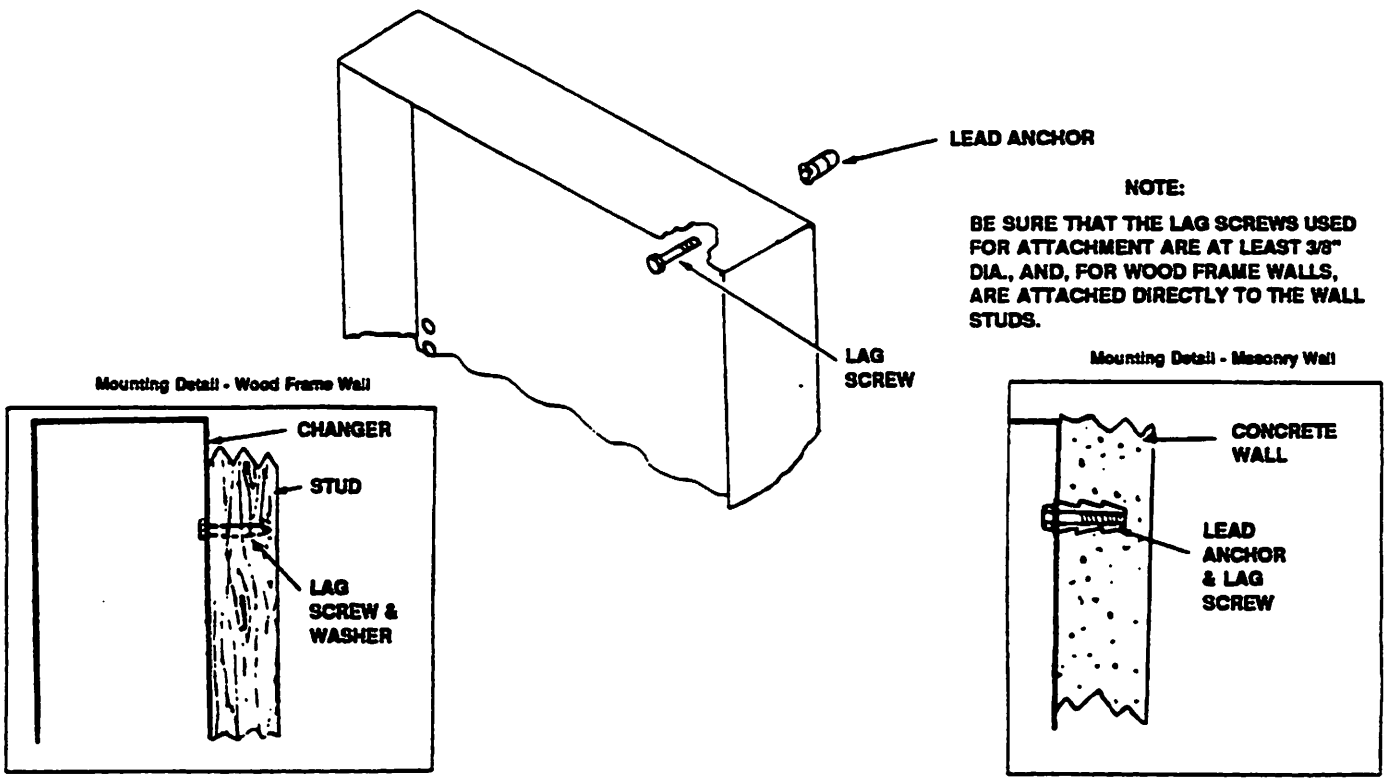

LEAD ANCHOR
NOTE:
BE SURE THAT THE LAG SCREWS USED FOR ATTACHMENT ARE AT LEAST 3/8" DIA., AND, FOR WOOD FRAME WALLS, ARE ATTACHED DIRECTLY TO THE WALL STUDS.
LAG SCREW
Mounting Detail - Wood Frame Wall
CHANGER
STUD
LAG SCREW & WASHER
Mounting Detail - Masonry Wall
CONCRETE WALL
LEAD ANCHOR & LAG SCREW

Figure 2-2. Attaching The BC-150 To A Wall

LOADING THE HOPPER

Review figures 2-3 and 2-4a before you begin.

1. Pull the hopper forward to its stop point.

2. Twist the top of a full coin bag one full turn. Grasp the twisted top with one hand and hold the bottom of the bag with the other. Invert the bag and insert the top into the mouth of the hopper.

3. Slowly release the twist as the bag empties. Avoid spilling coins into the changer. Empty the bag by grasping it at the bottom and shaking it to dislodge coins in folds of the bag. Lift the hopper latch then push the hopper back into place.

4. Coin I.D. stickers are supplied with the machine to identify the coin denominations in the hopper. Attach one of these stickers to the hopper so that the coin denomination is easily identified.

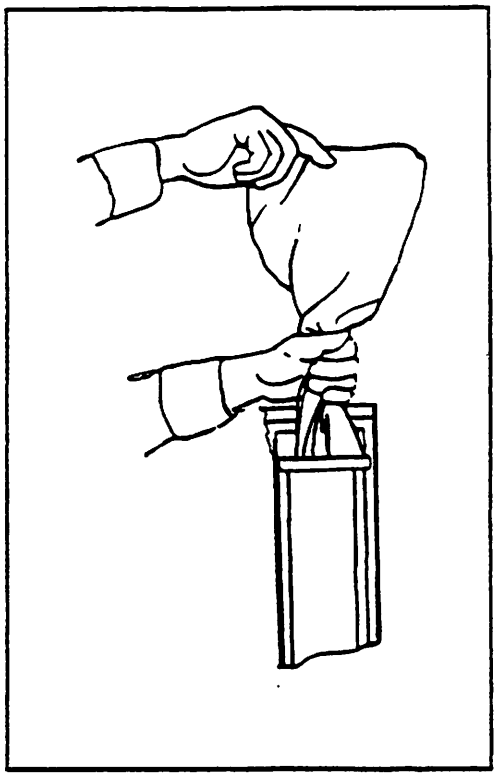


Figure 2-3 Loading The Hopper

NOTE:

The hopper may be loaded with either SBA Dollar coins, quarters, or tokens (nickels or dimes if the optional hopper is being used). Make sure that the value of coins loaded into the hopper agrees with the values programmed into the computer during the HOPPER VALUE (HOP VAL) **step of setup.**

UNLOADING THE HOPPER

Refer to *figure 2-4* and unload the hopper as follows:

1. Swing the hopper stop rod out into its operating position.

2. Pull the hopper forward to the stop point.

3. Place the opening of the coin bag over the mouth of the hopper, wrapping the lip of the bag around the handle. Grasp the bag and handle with one hand, tilt the hopper back, lift the hopper latch, and slowly tip the hopper forward while holding the bag against the front of the hopper.

4. Hold the bag securely while you tip the hopper forward. Tap the hopper against the stop rod and return it to the upright position. Repeat two or three more times to ensure that the hopper is completely empty.

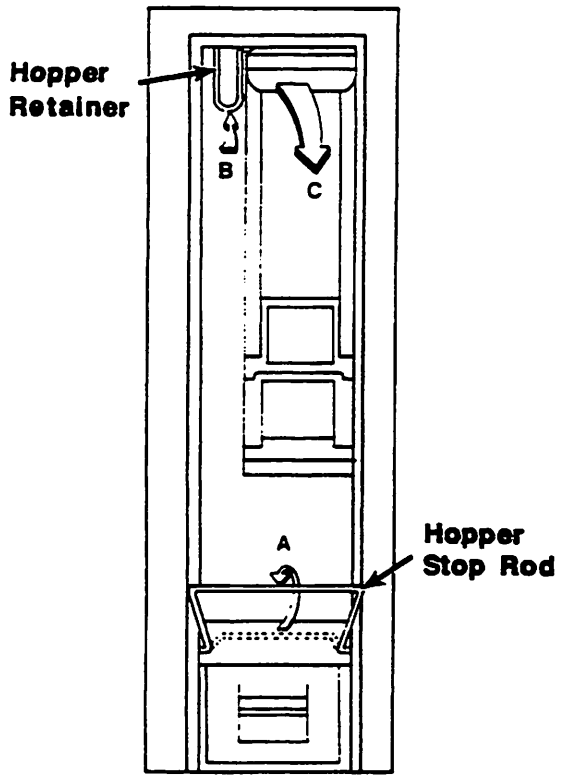


Figure 2-4A. Releasing The Hopper

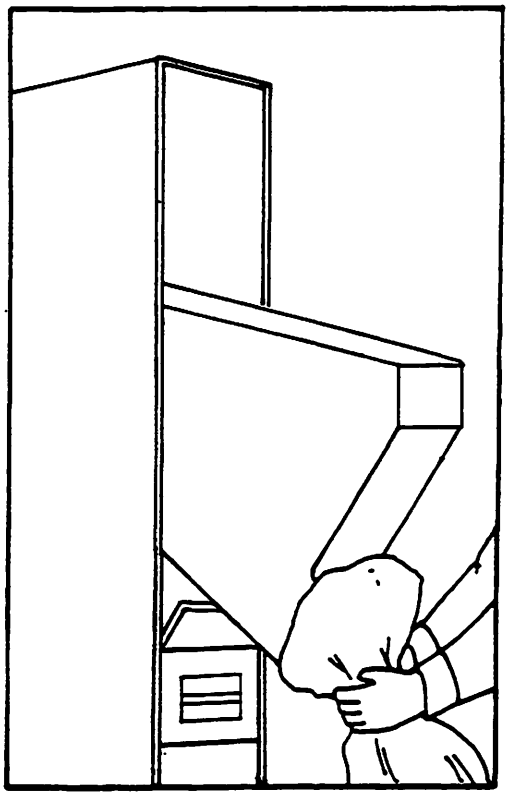


Figure 2-4B. Unloading the Hopper

5. The hopper may also be removed from the machine and inverted over the bag to empty. When replacing the hopper, be sure that it is setting securely in the pivot brackets and snug against the back plate. Put the stop rod back in its storage position.

OPERATIONAL INFORMATION

This bill changer uses several visual indicators and controls. The location of these controls and indicators are as follows:

On-Off Switch	Located on the front surface of the power control center
Circuit Breakers	Located on the front surface of the power control center (four total)
Dollars Accepted Counter	Located on the front of the power control center
Test Switches	Located on the front surface of the power control center (non-functional)
Voltage LED's	+5 VDC, +12 VDC, +30 VDC and +40 VDC are located on the edge of the power supply board visible from the front of the power control center
Service/Programming Switches	Located on the changer control computer
Status Display	Located on the changer control computer

SETTING UP THE BC-150

These steps should be followed to setup the BC-150 to your requirements. If you do not follow these steps, the BC-150 will remain all or partially programmed to the factory settings.

This procedure follows the "beginning-to-end" setup sequence. You should follow this procedure and use it until you are familiar with the eight groups of setup options. Once you are familiar with these options, you can easily skip over the options that you do not wish to change or display.

Key Information

In the step-by-step procedure that follows, key setup information follows many of the numbered steps. This information will be very helpful, but it can be skipped. Key information paragraphs are indicated by a small to the left of the key paragraph.

Turning The Power On

1. Turn the power switch ON. Three of the four voltage LED's on the power control center should now be ON. The +40 VDC LED will be OFF. The OUT OF SERVICE light will be lit.

2. The message: BC-150 will briefly appear on the display.

3. The message: VERSION XX will briefly appear on the display. XX is the version number and should match the version number on the EPROM label, which is visible through the cover of the CCC.

4. The message: CHECKSUM XXXX will briefly appear on the display. XXXX is the 16-bit EPROM checksum. The Right-most two digits must be 00.

5. Next, the RAM TEST PASSED (or FAILED) message will briefly display. If the word FAILED appears, the changer will remain in the OUT OF SERVICE mode.

6. When the RAM TEST PASSED message disappears, the "walking" dash will appear. The +40 VDC LED will light and the OUT OF SERVICE light will turn OFF.

Switching To The Programming Mode

Steps 1 and 2 display "audit" information. These two steps are the only displays that will appear if an access code (other than 0000) is used and the operator has not yet entered the correct access code.

To enter the PROGRAMMING mode:

1. Move the slide switch on the CCC to the PROGRAMMING mode position.

   The display will change from the "walking dash" to TEMP COUNTERS. This function will allow you to view and reset the quantity of each denomination that has been accepted since the numbers were last reset to 0. The denominations are displayed in the following order: $1, $2, $5, $10, and $20 as the VALUE pushbutton is pressed. The last item displayed is the AMOUNT $XXX-XX — This is the dollar amount accepted since the last time it was reset to zero. Push VALUE again to wrap around to the $1 displayed quantity.

   The counts previously listed can be reset individually by pressing both of the arrow pushbuttons (Λ and V) at the same time while that count is displayed. You can reset all of the counts and the amount accepted at once by pressing the HOPPER and Λ pushbuttons at the same time while any one of the counters is being displayed. At this time, the message TOTALS CLEARED will be displayed briefly to indicate that all of the numbers have been reset to zero.

2. Press the FUNCTION pushbutton and the display will change to PERM COUNTERS.

- This display indicates the quantity of each denomination that has been accepted since the machine was built. To use these for periodic audits, you must know the starting count and current count and subtract. These quantities cannot be reset. Press the VALUE pushbutton, to display the denomination and quantity of each denomination accepted.

3. Press the FUNCTION pushbutton and the display will change to PROGRAMMING ----.

This is the display for entering the four digit access code. Initially, the BC-150 access code is set to 0000. This is a special access code in that no further entries are required to reach the set up functions described below-simply press the function button to advance to the setup functions. If any other code has been entered into the computer, however, access to set up functions will be denied unless the correct code is entered.

IF NO ACCESS CODE HAS BEEN ESTABLISHED

4. Go directly to *Step 5.*

IF AN ACCESS CODE HAS BEEN ESTABLISHED

A. The left two digits of the access code will be blinking (this is the BC-150's way of indicating which information will be changed if you make a change). Press the ∧ or ∨ pushbutton to change the left two digits of the four digit access code.

- The ∧ and the ∨ pushbuttons will allow the numbers 00 through 99 to appear in each of the two halves of the four digit access code.

B. When the display shows the correct two left-hand digits of the access code, press the VALUE pushbutton.

C. The right two digits of the access code will be blinking at this time. Press the ∧ or ∨ pushbutton until the right two digits of the four digit access code are correct.

D. When the display shows the correct two right-hand digits of the access code, press the VALUE pushbutton to advance to the setup functions that follow (if an incorrect code is entered, the display will show: LEVEL 0 ACCESS; then, it will return to the PROGRAMMING ---- display. A correctly entered code will display LEVEL 1 ACCESS):

TO PROGRAM A DIFFERENT ACCESS CODE

A. If the access code is presently 0000, go directly to Step C which follows.

B. If a non-zero access code is currently in the computer, you must first enter that code as described in the previous paragraph. Then, using the FUNCTION pushbutton advance through each of the setup and audit functions until PROGRAMMING ---- is again shown on the display.

C. Enter the desired access code using the (∧), (∨), and value pushbuttons as described in *Step C* and *Step D* in the previous procedure, but do not press the VALUE pushbutton a second time. With the desired four-digit code showing on the display, press and hold the HOPPER pushbutton for about three seconds until the message NEW CODE STORED appears. The new code has now been stored in the computer's memory and will be the required access code the next time the programming mode is entered.

5. Press the FUNCTION pushbutton and the display will change to HOP VAL - - - - - -.

   The HOPper VALue option allows you to select the denomination to be dispensed from the hopper *(see table 2-3 for the list of denominations).* If the hopper value is set to dashes (- -), the hopper will not dispense any coins at any time.

   The computer must know the value of coins used for one important reason. The BC-150 supports a "correct payout feature" — the computer simply will not allow you to program a payout that does not total the amount taken in unless you set the hopper value to tokens. The correct payout feature prevents programming errors and the resulting over or under-payment.

6. The left two dashes will be blinking. Press the VALUE pushbutton to step through the possible hopper denominations. Stop when the correct hopper value is displayed.

Use the coin value stickers supplied in the accessories bag to label the hopper as a reminder of which coins are to be loaded in each hopper.

Table 2-3. BC-150 Hopper Value Codes

Display Symbol	Money Type
5	Nickel
10	Dime
25	Quarter
$1C	Dollar (SBA)
T1	Token Type 1
T2	Token Type 2
T3	Token Type 3

7. Press the FUNCTION pushbutton and the display will change to ACCEPT $1 YES (or NO).

8. Press either the ∧ or ∨ pushbutton to select (turn ON) or deselect (turn OFF) each denomination. Press VALUE to step through the list of denominations that can be accepted *(see table 2-4 for the list of denominations).*

Table 2-4. BC-150
Acceptance

Display Symbol	Money Type
$1	One Dollar Bill
$2	Two Dollar Bill
$5	Five Dollar Bill
$10	Ten Dollar Bill
$20	Twenty Dollar Bill

Select only the denominations that you want to have the BC-150 accept by using the ∧ or the ∨ pushbutton.

9. After you have programmed the denominations you wish to accept, press the FUNCTION pushbutton to move on to the PAYOUT function.

10. The display will show:

    XXX PAY - -. The XXX will the lowest bill denomination set to ON.

    The right two digits will be blinking.

11. Press the ∧ or the ∨ pushbutton to increase or decrease the coin count to be paid from the hopper.

    Once you have the count set as you want for the displayed denomination, press the VALUE pushbutton to advance to the next denomination. If you have made an error and the payout value is not equal to the displayed denomination, the display will briefly show INCORRECT PAYOUT and then return to the same denomination – refusing to advance. This is true unless you have set the hopper value to one of the token values. You will not be able to leave this display, even if you put the PROGRAMMING/NORMAL switch in the NORMAL position.

    When the VALUE pushbutton is pressed and held for more than two seconds, the display will show XXX PAYS - - - -. The XXX represents the current denomination. The - - - will show TOKENS if tokens are loaded into the hopper or if only coins are used, the display will show the total dollar value of the coins to be paid out.

12. After you have programmed the payout for all of the denominations being accepted, press the FUNCTION pushbutton to move on to the COIN CONTROL function.

13. The display will show: COIN CONTROL ON (or OFF)

14. Press either the Λ or the V pushbuttons to turn the COIN CONTROL feature ON or OFF.

WARNING:

If the COIN CONTROL option is turned OFF, there is a possibility that a customer could be short-changed if the hopper goes empty.

Once you have set the COIN CONTROL option, press the FUNCTION pushbutton to advance to the beginning of the entire programming sequence (TEMP COUNTERS will show on the display) and you may review your setup by stepping through each function again.

To return the bill changer to normal operation, move the slide switch from the PROGRAMMING to the NORMAL position. The display will show the "walking dash" again.

USING THE COIN CONTROL SYSTEM

Keeping track of money paid out is automatically done by the bill changer control computer. When the remaining amount of money gets too low, the bill changer will shut down with the error message: LOW HOPPER LEVEL.

Telling the BC-150 how much money is loaded in the hopper and maintaining this amount is done by the FUNCTION, Λ, and V pushbuttons in the NORMAL operating mode.

Pressing the FUNCTION pushbutton, while in the NORMAL mode, with the COIN CONTROL option turned on, will cause the display to show the amount of money or number of tokens remaining in the hopper. If coins are being dispensed, the display will show $XX LEFT, where XX is the amount in dollars left in the hopper. If tokens are being dispensed, the display will show: XXX TOKENS LEFT, where XXX is the number of tokens remaining in the hopper. At this display, the dollar amount or the number of tokens can be reset to zero by pressing the Λ and V pushbuttons at the same time.

Press the FUNCTION pushbutton a second time to advance to the next COIN CONTROL mode. The display will show: ADDING 0. Pushing the Λ pushbutton will add either $50 or 50 tokens to the hopper total. Each time the Λ pushbutton is pressed, another $50 or 50 tokens is added to the hopper total. The V pushbutton will subtract $50 or 50 tokens. Use the Λ and/or V pushbuttons, as described, to let the computer know how many coins or tokens you have added to the hopper. Press the FUNCTION pushbutton to return to the NORMAL mode.

If the amount of money or number of tokens entered is not adequate to ensure payout of the largest denomination dispensed (plus 25 extra coins), the bill changer will shut down immediately with the error message: LOW HOPPER LEVEL. When this message is displayed, pressing the FUNCTION/ERROR CLEAR pushbutton will display the amount of money or the number of tokens left in the hopper. Pressing the FUNCTION pushbutton again will allow you to add more money or tokens to the hopper total as described above.

The bill changer control computer will not let the bill changer go into NORMAL operation until the dollar amount or the number of tokens is adequate to payout the largest denomination dispensed (plus 25 extra coins).

When the COIN CONTROL option is turned OFF, the computer does not keep track of the number of coins or tokens that are left in the hopper. The bill changer will shut down with the error message: SHORT XX COINS if it cannot payout the correct number of coins. The XX indicates the number of coins that the last customer was shorted.

SELF DIAGNOSTICS

Diagnostic Check

The self diagnostic features of the BC-150 are centered around the 16-character status display. The message displayed may be on all the time (STEADY STATUS MESSAGE), or they may blink on and off (FLASHING FAULT MESSAGE).

Fault Message Check

1. Remove the hopper from the machine. Block the coin detector on the dispenser with an opaque object—a piece of steel, for example. The machine will go out of service. The status display will flash the message CK L COIN DETCTR and the TEMPORARILY OUT OF SERVICE light on the door will light.

2. Restore the machine to service by removing the object that is blocking the detector and pressing the FUNCTION pushbutton.

3. The CCC will remove the fault message and the machine will return to service.

4. Replace the hopper.

For detailed explanations of the various fault messages, *refer to Section 4, Troubleshooting.*

Status Messages

When a message is on the status display and it is not flashing, either a fault or malfunction occurred that was not serious enough to cause a shutdown or the message is a guide to solving bill acceptance problems.

BILL ACCEPTANCE MESSAGES

A bill may be rejected for a number of reasons. The status display will indicate the reason why a bill failed to be accepted. A number of cell sequence rejects and bill validation rejects exist. These messages will be displayed for approximately five seconds before they are erased by the walking dash. For more information on reject messages, *refer to Section 4, Troubleshooting.*

TRANSPORT SELF-CLEAR CHECK

If a bill becomes jammed in the transport, the BC-150 automatically tries to clear it out. To check out this feature:

1. Insert bill into transport upside down. The bill will reject and status display will show REJECT-NO MAG.

2. Hold the bill in the transport. Do not uncover the VI cell. Wait five seconds for the transport to start to cycle reverse-forward-reverse-forward-reverse. The transport will do this three times if VI cell is kept covered. During the self-clear operation, the status display will show the message PURGING ACCEPTOR.

3. The motor will stop and the status message will change to CK TRANSPORT VI (If the VI cell is uncovered any time during the self clear cycle, the machine will automatically go back into operation).

4. Restore machine to service by removing the bill.

ACCEPTANCE CHECK

To aid in checking acceptance, set the hopper value to T1, T2, or T3. Set all pay counts to zero. This will allow checking out the validation portion of the system without having the hopper motor run.

1. Make certain that the bill is programmed to be accepted.

2. Insert a dollar bill upside down. The bill should reject and the display should show REJECT-NO MAG.

3. Insert the dollar bill correct side up, but backwards. The bill should reject and the display should show a message REJECT-BILL (B).

Now insert the dollar correctly. It should accept, the stacker should operate (since all payouts are set to zero, the hopper motor should not operate). The dollar accepted counter should also advance one count.

Also, as the bill moves through the bill acceptor, check to ensure that the following messages are shown on the status display:

1. VALIDATING will appear as the bill is inserted and while the transport is running.

2. $1 PAYS 000 will appear when the bill is validated and stacked.

3. If bills in good condition are rejected frequently, note the reject message on the status display and *refer to Section 4* for troubleshooting information.

4. If the machine is set up to accept other bills, the previous checks should also be performed with all other denominations.

   When other denominations are accepted, the display will show $XX PAYS 000 where the XX represents the denomination.

MISCELLANEOUS

The BC-150 was designed to be simple and easy to troubleshoot. Please take time to study the operation of the machine and to study the explanations of the various status messages.

The following is a list of incidental characteristics that may be of interest to the operator and service man.

1. The +5 VDC voltage from the power supply does not control the CCC board. It is used to provide voltage to LED's (dispenser, transport, and OUT OF SERVICE light). The computer board is powered primarily by the +8 VDC voltage from the power supply. It has its own +5 VDC regulator.

2. If power is disrupted during a dispense cycle, the machine will immediately reset upon power turn on. The customer will most likely be short-changed.

3. Blocking the coin photo detector with your fingers, or with foreign objects during replenish cycle may result in wrong counts. If the detector is blocked too long, the machine will shut down with a flashing error message indicating that the detector was blocked. If the wrong count is entered the display may show a flashing message EXTRA COIN. Either condition will put the machine in a shutdown mode.

4. Always turn power OFF when removing circuit boards. Avoid touching the connectors when handling these assemblies.

WARNING:

When the machine is turned on, there is 120 VAC voltage on the computer control board. If, for any reason this board is plugged in without its cover on, BE CAREFUL!

Section 3: Routine Service

INTRODUCTION

In order to maintain control over money used for change dispensing, each changer should be charged with a predetermined amount of cash. The inventory should be checked periodically as a precaution against malfunction and theft. Inventory control is most easily accomplished by using the replacement method of servicing. Using this method, all bills and coins are removed by the route man and the empty hopper is refilled with a predetermined amount of change. The money removed is returned and all cash is counted against the charged inventory. Any discrepancy is easily detected at this time (for more information, see *Low Hopper Level* in the *Troubleshooting* paragraphs of *Section 4*).

Service frequency on the changer is directly related to the inventory of change maintained and customer usage. Check changer usage daily and schedule service as required.

REMOVING A JAMMED BILL FROM THE BILL ACCEPTOR

Jammed bills can be easily removed in the following manner:

1. Unlock and open the door. Turn the power OFF.
2. Slide the bill acceptor out until it stops.
3. Remove the jammed object from the acceptor.

BILL JAMMING CHECK LIST

If bills jam frequently, perform the following checks and corrective procedures *(see figure 3-1)*:

1. Make sure that all belts stay centered on all rollers when the transports running in either the forward or the reverse direction.
2. Check to see that both timing belts are snug (not too loose or too tight).
3. Make sure that the rubber drive rollers are not loose or worn.
4. Exit flipper must work freely.
5. Be sure that the Nylon idler roller rotates freely and moves up and down freely in its slot. The retaining springs must also slide without bind in the guide slots and exert adequate force on the idler roller.
6. Bottom track bill surfaces must be free of dirt, moisture, burrs, projections, rough spots, etc., which might drag or hang up on the surface of bill.
7. The magnetic head must have a bevelled edge on both front and back to keep both bill edges from becoming caught in forward or reverse.
8. Nylon rollers on the magnetic head assembly must rotate freely. No dirt, moisture, burrs, projections, or rough spots can be on the magnetic heads or magnetic head holder.

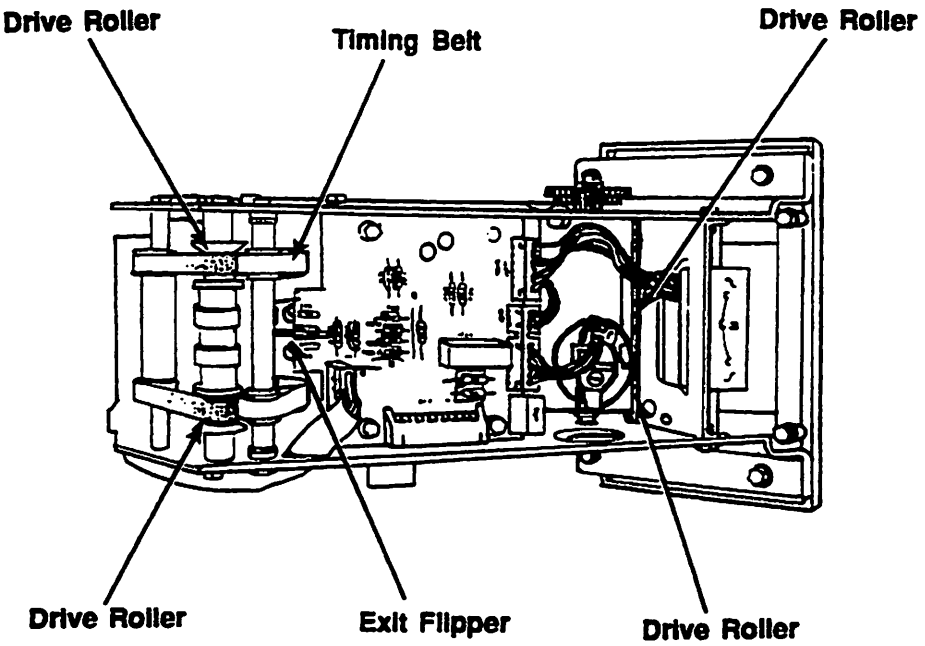
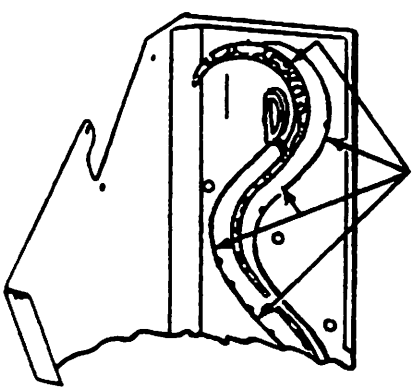


Figure 3-1. Transport Check Points

CLEANING THE HOPPER COIN PATH

The coin tracks are Teflon coated to minimize dirt build-up. It may still be necessary to clean them at regular intervals, as dictated by the number of vends and the environment, to prevent dirt accumulation in the coin path.

Failure to keep the coin path clean may result in coins sliding out of the track, indicating an empty condition even though the hopper contains sufficient coins. Clean the hopper as follows:



Clean Top And Angular Coin Path Surfaces, Especially At Guide Edges, As Shown.

Figure 3-2. Cleaning The Hopper Coin Path

1. Remove the hopper from the bill changer and place it on a working surface.

2. Using the Nylon hopper cleaning brush supplied with each machine, remove all dirt from the angular sides and flat surfaces of the serpentine coin path as shown in *figure 3-2.*

NOTE:

Chain lubrication is not normally required.

3. Install the hopper in the bill changer and run a few bills through to check for proper hopper operation.

CAUTION:

Do not use detergents to clean the hopper. The hopper has been factory lubricated and detergent cleaners destroy this lubrication.

TEST PROCEDURES

Transport Motor Speed Check

The BC-150 transport motor speed and direction are computer controlled. No adjustments can be made, however the encoder on the back of the motor can be checked. The computer detects pulses from this encoder for speed control.

1. Remove the transport from the machine, but keep it plugged in and keep the bill changer power ON.
2. Turn the transport over and connect the Common lead of a voltmeter to P701, Pin 10. Connect the other lead to P701, Pin 9. Turn the transport motor drive shaft very slowly by hand. The meter should alternately read voltages below 0.7 VDC then above 3.8 VDC.
3. One rotation of the motor drive shaft will produce 100 pulses.

Dispenser Coin Detector Check

1. Remove the hopper from the machine.
2. Turn the bill changer power on. Verify that the Red LED is lit and is shining on the hole in the upper coin chute assembly (The dispenser hold-down screw may be removed and the dispenser pulled forward to allow viewing).
3. Connect the common lead of a voltmeter to P3 Pin 4 on the CCC. Connect the other lead from the voltmeter to P4 Pin 1. A voltage reading between 2.8 VDC and 5.1 VDC should be observed.
4. Block the light path in the detector with an opaque object. The voltage reading should drop below 0.7 VDC. The CCC should shut-down with the error message: CK L COIN DETCTR.
5. Remove the object blocking the coin detector, then push the FUNCTION button to clear the error.

Testing BC-150 Transport Photocells

The transport photocells are automatically checked each time the transport is turned on. Each photocell and light combination goes through a short test and brightness adjustment process. This process continues as long as the transport receives power. No adjustments can be made; however, a bad photocell can be detected with a voltmeter. All measurements are made with the Common lead of the voltmeter connected to P701, Pin 10 on the transport (the voltmeter should have a minimum impedance of 10 megohms).

Photocell Troubleshooting Chart

Photocell	Action	Voltage Expected
VI - Transport Inlet	No Action - Leave the inlet open	P701, Pin 7 should be between 0.2 VDC and 1.9 VDC
	Block the light path by inserting paper or a bill into the transport opening	P701, Pin 7 should increase at least 0.5 volts from the reading taken with the inlet open. The transport motor should start running forward. Hold the bill in place until you finish the reading, then remove the bill and let the transport finish cycling.
VF - Flipper Cell	No Action - Leave flipper in rest position	P701, Pin 5 should be less than 1.0 VDC
	Block the light path with the flipper	P701, Pin 5 should be greater than 2.8 VDC
VT - Transmissive Cell	No Action - Leave the light path open	P701, Pin 4 should be 0.75 VDC to 1.25 VDC
	Block the light path by inserting paper or a bill between the transmissive cell and the transmissive/reflective LED in the middle of the transport	P701, Pin 4 should increase by at least 0.75 VDC from the reading taken with the light path open
VR - Reflective Cell	No Action - Leave the light path open	P701, Pin 6 should be between 0.8 VDC and 2.0 VDC
	Insert a white piece of paper between the transmissive cell and the transmissive/reflective cell	P701, Pin 6 should increase by at least 0.25 VDC from the reading taken without white paper inserted.

ADJUSTMENTS

Hopper Chain Adjustment

NOTE:

Make sure the hopper is empty of all coins before you adjust the chain tension.

1. Loosen the three screws at the top back of the hopper, which will allow the black plastic upper chain guide ring to move diagonally upwards.
2. Pull the upper chain guide ring up as shown in *figure 3-4*, while you rotate the drive pin clockwise until the slack is removed from the chain but no binding is evident.
3. Tighten the three screws making sure the lower screw is tightened last. If a torque wrench is available, adjust the chain so that the torque input at the drive pin is one to four inch pounds.

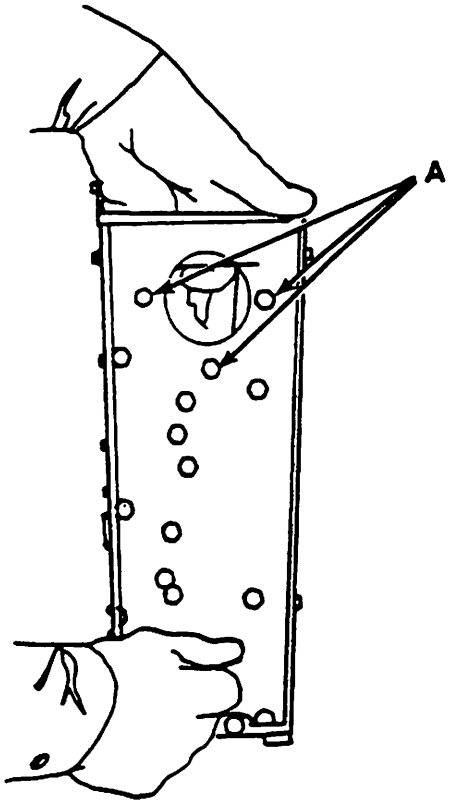


Figure 3-4. Hopper Chain Adjustment

Bill Stacker

A stacker cycle will start each time a bill is accepted. Adjust the bill stacker switch as follows:

1. Remove the bill stacker from the bill changer.
2. Hold the motor brake in (disengaged) and manually rotate the motor shaft until the stacker is one-half cycle away from HOME position (the stacker push plate is at its outer most extended position). The cam and cam switches should be accessible from below and the narrow lobe of the cam should be pointed at the switches as shown in *figure 3-5.*
3. Adjust the cam switches by loosening the adjustment screw and rotating the switch bracket until a .281 diameter rod bottoms against the switch as shown (an ordinary wooden lead pencil is approximately this diameter).
4. Tighten the adjustment screw and re-install the stacker in the changer.
5. Install the stacker, turn on the power, and the stacker will return to its HOME position automatically.

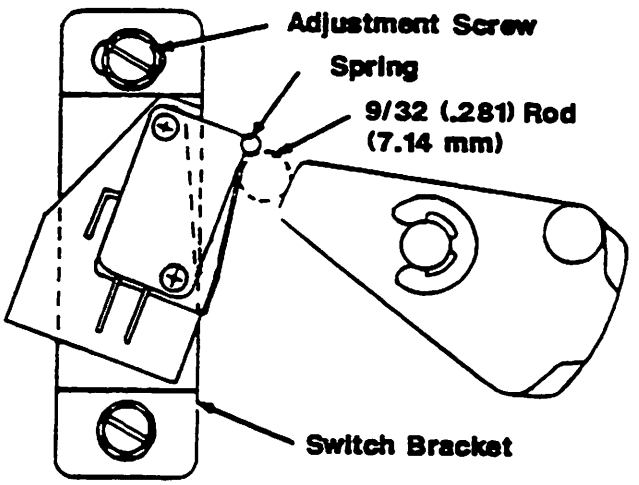


Figure 3-5. Stacker Switch Adjustment

Timing Belt Tension

Refer to figure 3-6 for this adjustment procedure.

1. Turn transport upside down.
2. Loosen the two screws (A) holding the belt tension adjustment levers (B) on both sides of the bill acceptor transport.
3. Make sure that the adjustment levers, adjusting roller and shaft move freely.
4. The timing belts should be adjusted tight enough that they do not come off the pulleys, but not so tight that they put excessive load on the transport. This tension is achieved by adjusting the belts to the point that the slack is taken up. If a more precise adjustment is desired perform the following step:
   A. Apply 75 grams of perpendicular force to both belt tension adjustment levers at the same time and then tighten all four screws.

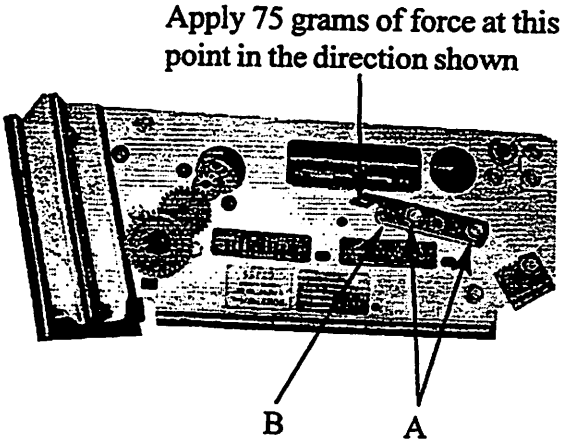


Figure 3-6. Timing Belt Adjustment

Section 4: Troubleshooting

INTRODUCTION

The BC-150 incorporates major assemblies and components as field replaceable plug-in units. There are several on-board diagnostic indicators on these assemblies. The information in this section takes full advantage of this design by isolating possible malfunctions to one or more of these basic plug-in units. This method saves time and requires little training in electronics.

The most significant troubleshooting aids for the BC-150 are the on-board LED's and the status display on the Changer Control Computer (CCC).

POWER UP DIAGNOSTICS

As power is applied to the BC-150, a series of power up checks are performed by the CCC before the machine is put into service. The 16 character alphanumeric status display on the CCC is the primary diagnostic indicator. A secondary indicator is provided by the green reflective/transmissive LED in the bill transport.

The following chart describes the power up sequence along with what is shown on the status display. The condition of the secondary indicator is also described.

Action - Turn the Power Switch to the ON position.

Power-Up Sequence

Sequence	Status Display	Transport LED
1	Display shows: BC-150	LED flickers ON briefly
2	Display shows: VERSION XX	LED remains OFF
3	Display shows: CHECKSUM=XX00	LED Turns ON for about ½ second then turns OFF
4	Display shows: RAM TEST PASSED	LED Turns ON for about ½ second then turns OFF
5	Display shows: RAM TEST PASSED	LED Turns ON for about ½ second then turns OFF
6	Display clears then a walking dash appears	LED Turns back ON slowly

The steps that follow describe the power-up sequence in detail.

Sequence Descriptions

1. Power is turned on.

2. During this time the CCC is performing internal tests on it self. Several things may indicate trouble. If the LED in the transport comes ON and stays ON and the display stays blank, there is a problem with the microprocessor on the CCC board. If the LED in the transport continues with the power up sequence but the status display stays blank, there is a problem with the display and it associated circuits on the changer control computer board.

   The XX on the display represents a software version number that will be displayed there. Example: Version 1.0 software will be displayed as VERSION 10. The version number displayed will match the version number visible through the hole in the lower left corner of the CCC assembly.

3. During this time, the CCC is checking the integrity of its own program. The checksum displayed must end with two zeros. If the checksum does not add up right, the machine will not continue with the power up sequence. The display will be left showing the incorrect checksum and the LED in the transport will stay ON.

4. During this time, the CCC is testing the Random Access Memory (RAM). If the RAM test does not pass, the message on the status display will say RAM TEST FAILED. The machine will not continue the power up sequence and the LED in the transport will remain ON.

5. During this time, the CCC is checking the machine configuration. If the configuration is the same as when the machine was turned OFF, it will go to normal standby operation. If the configuration changed due to low battery voltage or some other reason effecting the RAM, the display will show SET UP REQUIRED. In this case, the machine will require reprogramming.

6. This is the stand by condition. A dash walks back and forth across the status display and the LED in the transport is ON.

MACHINE STATUS

The status of the machine is displayed on the status display during all phases of operation. The following section will describe the status messages displayed.

Standby Mode

The STANDBY mode is the normal, waiting to accept money, mode. All four voltage LED'S on the power control center are lit. The LED on the dispenser is lit. All LED'S in the transport are lit. There is a dash walking back and forth across the display. The hopper motor, stacker, and transport motors are OFF. The OUT OF SERVICE lamp is OFF.

In the STANDBY mode, the HOPPER and VALUE keys on the CCC have special functions. When the VALUE key is pressed, the status display will show AMOUNT $XX-XX, where XX-XX is the amount of money that has been accepted since this amount was last cleared. When the HOPPER key is pressed, the status display will show LAST XXX XXX XXX, where the XXX indicates the last three denominations paid out. The denomination on the left is the most recent, the denomination in the center paid before the one on the left and the denomination on the right paid before the center denomination.

Accept And Payout Modes

During normal operation, the display will reflect each state the machine goes through as it happens. When a bill is moving in the transport, the message VALIDATING will appear. After validation, during the stack and vend cycles, the display will show the message XX PAYS --. The XX indicates the denomination just accepted and the -- represents the number of coins from the hopper needed to be paid out. During payout, as coins pass through the detector, the displayed coin count will be reduced until it reaches zero. The machine will then return to the STANDBY mode.

Reject Mode

While the machine is validating a bill, several things may cause the bill to be rejected. When a bill is rejected, the transport will reverse returning the bill and the status display will show a reason for the reject. This reject message will stay on the display for about five seconds, then the walking dash will erase it. A list of reject codes follows with an explanation for each and some hints on where to look for trouble if the same reject message continues to appear.

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VALIDATION REJECTS

Cell Sequence Rejects

REJECT-SHORT VI

Symptom:

The inlet cell was covered for too short of a time.

This is a reject message.

The bill was rejected because the VI cell was not covered long enough. The bill may have been torn on the right side, torn, or folded over at the trailing edge of the bill. If bills are rejected frequently with this code, the VI cell may be giving an intermittent signal.

This message may also appear if VT is giving an intermittent signal.

Corrective Action:

1. Check the VI cell for proper switching.
2. If the cell is OK, check the wiring from the VI cell to the CCC for a possible short to the chassis.
3. Check the VT cell for proper operation *(see Section 3, Testing BC-150 Transport Photocells).*
4. Check the wiring from the VT cell to the CCC for possible shorts or opens.
5. The +5 VDC supply to the LED's may be below 4.5 VDC; check the voltage. If it is low, replace regulator VR801 on the power control center *(see the components list for the power supply circuit board).*
6. If all of preceding checks are OK, replace the CCC.

If the bill is left in the transport for five seconds, the machine will go into SELF-CLEAR.

REJECT-SHORT VF

Symptom:

Flipper cell covered for too short a time.

This is a reject message.

The bill was rejected because the flipper cell was uncovered too soon and the CCC recognized this as a non-valid validation sequence. If bills are rejected frequently with this message:

Corrective Action:

1. Check for small pieces of paper or other foreign objects in the track.
2. The flipper may be binding or hanging-up on the back rollers. Check for flash or burrs on the flipper and back rollers.
3. The flipper cell may be giving an intermittent signal. Check the cell for proper switching. If the cell is OK, check the wiring from the transport to the CCC for a possible ground to the chassis.
4. If all of the preceding checks are OK, replace the CCC.

If the bill is left in the transport for five seconds, the machine will go into SELF-CLEAR.

REJECT-VI AGAIN

Symptom:

A second bill was inserted while validating the first bill.

This is a reject message.

A bill was rejected because the VI cell was covered while the changer was in the process of validating a bill.

Wait until the changer completes the cycle before you insert the next bill.

If bills are rejected frequently with this code, the VI cell may be giving an intermittent signal.

Corrective Action:

1. Check the VI cell for proper switching. If the cell is OK, check the wiring from the VI cell to the CCC for an intermittent open connection.
2. If both of the preceding checks are OK, replace the CCC.

If the bill is left in the transport for five seconds, the bill changer will go into SELF-CLEAR.

REJECT-TIMEOUT

Symptom:

Inlet cell was never uncovered.

This is a reject message.

The bill was rejected because the VI cell never uncovered. The CCC recognized this as a non-valid validation sequence. Take the following corrective action if bills are rejected frequently with this code.

Corrective Action:

1. Check for small pieces of paper or other foreign objects in the track.
2. The VI cell may be giving an intermittent signal. Check the VI cell for proper switching.
3. If the cell is OK, check the wiring from the VI cell to the CCC for a possible short to the chassis.
4. The +5VDC supply to the LED's may be low; check the voltage. If it is low, replace the regulator on the power supply board, which is inside the power control center.
5. If all of the preceding checks are OK, replace the CCC.

If a bill is left in the transport for five seconds, the bill changer will go into SELF-CLEAR.

REJECT-LONG VI

Symptom:

The inlet cell was covered for too long a time.

This is a reject message.

The bill was rejected because the VF or VT cell was covered too soon, or the VI cell was covered too long.

The CCC recognized this as a non-valid validation sequence.

If bills are rejected frequently with this code, take the following corrective action:

Corrective Action:

1. Check for small pieces of paper or other foreign objects in the track.
2. The VF flipper may be binding or hanging-up on back rollers.
3. Check for flash or burrs on flipper and back rollers.
4. The VF cell may be giving an intermittent signal. Check the cell for proper switching. If the cell is OK, check the wiring from the VF cell to the CCC for a possible ground to the chassis.
5. The VT cell may be giving an incorrect or intermittent signal. Check the wires for broken or loose connections.
6. The voltage measured across the VT cell should be between .75 VDC and 1.25 VDC.
7. If all of preceding checks are OK, replace the CCC.

If a bill is left in the transport for five seconds, the bill changer will go into SELF-CLEAR.

REJECT-LONG VT

Symptom:

The transmissive cell covered for too long a time.

This is a reject message.

A bill was rejected because the VT cell was covered too long.

A bill may have hung-up or jammed in the transport.

If bills are rejected frequently with this message, take the following corrective action:

Corrective Action:

1. Check the portion of the transport track for any condition that would cause the bill to slow-up or hang-up (soft drink residue, catsup, burrs on track surfaces, etc.).
2. The drive belts of transport may be loose and slipping. Check them and replace them if necessary.
3. The center or back transport rollers may be worn. Check them and replace them if necessary.
4. If none of the preceding steps find the problem, replace the CCC.

If the bill is left in the transport for five seconds, the bill changer will go into SELF-CLEAR.

REJECT-LONG VF

Symptom:

The flipper cell was blocked for too long a time.

This is a reject message.

The bill was rejected because the VF cell was covered too long.

If this message appears often with good bills, check for tight VF flipper operation, incorrect transport to stacker alignment, or a non-operating stacker.

If a bill is left in the transport for five seconds, the bill changer will go into SELF-CLEAR.

REJECT-VT AGAIN

Symptom:

The transmissive cell was covered.

This is a reject message.

A bill was rejected because the VT cell re-covered while the bill changer was in the process of validating a bill.

If bills are rejected frequently with this message, check for a piece of paper or other material in the transport.

The VT cell may be giving an intermittent signal.

Corrective Action:

1. Check the VT cell for proper switching. If the cell is OK, check the wiring from the VT cell to the CCC for an intermittent open connection.

2. If all of the preceding checks are OK, replace the CCC.

If the bill is left in the transport for more than five seconds, the bill changer will go into SELF-CLEAR.

REJECT-NO MAG

Symptom:

Not enough magnetic signal from the Mag. Amp.

This is a reject message.

The bill was rejected because no signals came from the Mag. Amp.

The bill may have been inserted upside down.

If bills are frequently rejected for this message:

Corrective Action:

1. Check for intermittent connections in the Mag. Amp. harness or the White/Brown, White/Green wires from the transport to the CCC.
2. Check the bill pressure rollers in the transport for proper spring pressure.
3. Check the surface of the Mag. head for dirt buildup or foreign material.
4. If all of the preceding checks are OK, replace the transport.
5. If the problem still exists, replace the CCC.

If a bill is left in the transport for five seconds, the bill changer will go into SELF-CLEAR.

REJECT-LATE VF

Symptom:

The flipper cell did not cover.

This is a reject message.

The bill was rejected because the VF cell was not covered soon enough after the VT cell was covered.

The bill is possibly torn at its leading edge.

An object is possibly hung-up or jammed in the track.

If bills are frequently rejected with this message:

Corrective Action:

1. Check for tight, binding, or sticky flipper operation.
2. Check for an intermittent open circuit in the wiring to the VF cell.
3. Check the rear portion of the transport track for any condition that would cause a bill to slow-down or hang-up (soft drink residue, catsup, burrs in the track, etc.).
4. The drive belts of the transport may be broken or slipping. Check them and replace the drive belts if necessary.
5. If none of the preceding steps find the problem, replace the CCC.

If a bill is left in the transport for five seconds, the bill changer will go into SELF-CLEAR.

REJECT-SPEED

Symptom:

The transport motor speed is not correct.

This is a reject message.

The bill was rejected because the transport motor did not run at a constant speed during validation.

Corrective Action

1. An object is possibly hung-up or jammed in the track.
2. If bills are frequently rejected for this message, check for tight, binding, or sticky rollers, belts, or flipper.
3. Check that the timing belt tension is not too tight.
4. Check that the +12 VDC supply in the power control center is correct.
5. Check for an intermittent connection in the wiring for the +12 VDC supply, the Red, Black, and Shield wires, or the White/Black encoder signal wire.
6. Check the motor and timing gear backlash.
7. If all of the preceding checks are OK, replace the transport.
8. If the problem still exists, replace the CCC.
9. Replace the power control center if replacing the CCC does not correct the problem.

If a bill is left in the transport for more than five seconds, the bill changer will go into SELF-CLEAR.

REJECT-LOST TACH

Symptom:

The tach signal from the transport was lost.

This is a reject message.

The bill was rejected because the CCC cannot control the transport motor speed without a tach. signal.

Corrective Action

1. An object is possibly hung-up or jammed in the track.
2. Check for a tach. signal as outlined in *Test Procedures in Section 3.* Replace the transport if the tach. is bad.
3. Check for intermittent connections in the wiring from the transport to the CCC.
4. If all of the preceding checks are OK, replace the CCC.

REJECT-VF OPEN

Symptom:

The flipper cell opened too soon.

This is a reject message.

The bill was rejected because the VF cell opened during validation.

The bill is possibly torn, or it may have a hole in it.

An object is possibly hung-up or jammed in the track near the flipper.

If bills are frequently rejected for this message, take the following corrective action:

Corrective Action:

1. Check for tight, binding, or sticky flipper operation.
2. Check for an intermittent open circuit in the wiring to the VF cell.
3. If the preceding checks do not find the problem, replace the CCC.

If a bill is left in the transport for five seconds, the bill changer will go into SELF-CLEAR.

BILL PARAMETER REJECTS

Take corrective action only if all bills or a significant number of bills reject for the same reason. Be sure to try different bills and bills of different denominations. If they accept, the bill being rejected has some property the CCC finds abnormal.

REJECT-BILL (B)

Symptom:

The bill failed validation.

Corrective Action:

1. Replace the Mag. amp/transport
2. Replace the CCC.

REJECT-BILL (C)

Symptom:

The bill failed validation.

Corrective Action:

1. Replace the Mag. amp/transport
2. Replace the CCC.

REJECT-BILL (D)

Symptom:

The bill failed validation.

Corrective Action:

1. Replace the Mag. amp/transport
2. Replace the CCC.

REJECT-BILL (E)

Symptom:

The bill failed validation.

Corrective Action:

1. Replace the VR cell, VT cell, VR/VT LED or transport.
2. Replace the CCC.

REJECT-BILL (F)

Symptom:

The bill failed validation.

Corrective Action:

1. Replace the transport.
2. Replace the CCC.

REJECT-BILL (G)

Symptom:

The bill failed validation.

Corrective Action:

1. Replace the VR cell, VT cell, VR/VT LED or transport.
2. Replace the CCC.

REJECT-ACCPT OFF

Symptom:

Bill denomination payout was not turned ON.

Corrective Action:

Set the bill changer to accept the rejected denomination.

Transport Errors

Transport errors are considered to be recoverable errors. That is, if the source of the error goes away, the machine will return to the normal STANDBY mode all by itself. Transport errors are shown on the status display while they are present. Occasionally after resetting a shutdown error or on power up, a transport error will briefly appear. This is normal and should not be a concern. A list of transport errors follows with an explanation for each and hints on where to look for trouble.

CLEARING ERRORS

Transport errors are self-clearing. When the trouble has been repaired, the error will go away on its own.

Bill changer errors are stored in the CCC and must be cleared. To clear an error displayed on the readout, push the FUNCTION key on the CCC while the CCC is in the NORMAL mode. If the situation that caused the error is repaired, the error will be cleared. Multiple errors will be stored in the CCC. Press the FUNCTION key to clear each error as it is displayed on the CCC readout (referred to as the "display"). When all errors are cleared, the changer will return to STANDBY.

CK TRANSPORT MAG

Symptom:

The Mag. amp output idle voltage is not within limits (0.20 to 4.90 volts).

Corrective Action:

1. Check the wires and connectors in the Mag. amp and transport harness.
2. Replace the Mag. amp circuit board.
3. Replace the transport.
4. Replace the CCC.

CK TRANSPORT VI

Symptom:

The transport inlet cell voltage is not within limits (0.2 to 1.9 volts).

Corrective Action:

1. Check the wires and connectors in the transport harness.
2. Replace the inlet cell.
3. Replace the transport.
4. Replace the CCC.

CK TRANSPORT VF

Symptom:

The transport flipper cell voltage is not within limits (less than 1.0 VDC).

Corrective Action:

1. Check the wires and connectors in the transport harness.
2. Replace the transport interconnect board.
3. Replace the transport.
4. Replace the CCC.

CK TRANSPORT VT

Symptom:

The transport transmissive cell voltage cannot be adjusted into the range of from 0.75 to 1.25 VDC.

Corrective Action:

1. Check the wires and connectors in the transport and transmissive cell harnesses.
2. Replace the transport transmissive cell and/or the transmissive/reflective LED.
3. Replace the transport.
4. Replace the CCC.

CK TRANSPORT VR

Symptom:

The transport reflective cell voltage is not within limits (0.8 to 2.0 VDC).

Corrective Action:

1. Check the wires and connectors in the transport harness.
2. Replace the transport reflective cell and/or the transmissive/reflective LED.
3. Replace the transport.
4. Replace the CCC.

CK TRANSPORT XX

Symptom:

Unknown transport error. XX indicates the error number.

Corrective Action:

1. Replace the transport.
2. Replace the CCC.

Machine Errors

Shutdown errors are errors which could cause damage to the machine or incorrect payouts.

All machine errors are stored in the CCC and displayed on the status display during STANDBY. All SHUTDOWN errors are displayed as blinking messages with the out of service lamp lit. The CCC can remember up to five errors, however, there will never be more than one shutdown error, as this will cause the machine to go out of service. All faults or malfunctions that cause errors must be repaired and the errors cleared from the CCC before the machine can go back to service.

Clearing Machine Errors

Clearing machine errors is done by simply pushing the FUNCTION key while the error is displayed. As each error is cleared, any previous errors will be displayed on the CCC. Press the FUNCTION key to clear each error. After all errors are cleared and no faults or malfunctions are left in the machine, it will return to the STANDBY state.

SHORT XX COINS

Symptom:

The changer could not payout the correct number of coins within 180 seconds. The number of coins displayed (XX) is the number of coins the customer was shorted.

Corrective Action:

1. Look into the hopper. If it is not empty, or low on coins, check for dirt, buildup on the coin path or a jammed hopper.

2. Check the coin detector and the wiring to the detector. If these are OK, the CCC may need to be replaced.

3. Reset the changer and insert a bill. See if the hopper motor runs. If the motor does not run, check the motor and motor wiring. If OK, replace the CCC.

4. If the hopper is empty, or almost empty, chances are that the amount of change loaded into the hopper was not as much as was programmed in during the last reload. When reloading the hopper, be sure that the amount that the CCC shows is the amount in the hopper.

LOW HOPPER LEVEL

Symptom:

Not enough coins are in the hopper to ensure that proper payout can be made for the highest denomination selected.

Corrective Action:

The hopper needs to be refilled. Below are two methods that can be used.

Method 1 assumes that each time the machine runs out of change, the entire contents will be removed and the machine reloaded with a new "charge" of change.

Method 2 can be used if additional coins are to be added to the hopper leaving the remaining coins in the hopper.

1. Do a complete reload

   A. Empty the remaining coins from the hopper. Remove the bills from the stacker.

   B. Press the FUNCTION pushbutton. The amount of money left in the hopper will be displayed. Record this amount and use it to check the coins removed from the hopper. Press both the Λ and the V pushbuttons at the same time to clear the remaining amount.

   C. Press the FUNCTION pushbutton. Press the Λ pushbutton until the display shows the dollar amount of change that you are going to load into the hopper.

   D. Press the FUNCTION pushbutton again to return the machine to normal operation. Load the new change into the hopper.

2. Do a partial reload

   A. Leave the change in the hopper. Press the FUNCTION pushbutton two times. Press the Λ pushbutton until the display shows the dollar amount of change that you are going to add to the hopper.

   B. Push the FUNCTION pushbutton again to return the machine to normal operation. Load the new change into the hopper.

COIN DETECTOR ERRORS WHILE IN THE STANDBY MODE

CK L COIN DETCTR

Symptom:

The coin detector was blocked too long while the bill changer was in the STANDBY state.

Corrective Action:

The coin photodetector input is, or was, giving an incorrect signal.

1. The LED on the dispenser may have burned out. Check the LED and replace it if it is defective. If the LED is still out, check the wiring to that LED.

2. If all LED's are not lit, check the +5 VDC LED on the power control center. If it is not lit, check the power supply. If it is lit, check +5V power distribution lines in the harness (Blue wires).

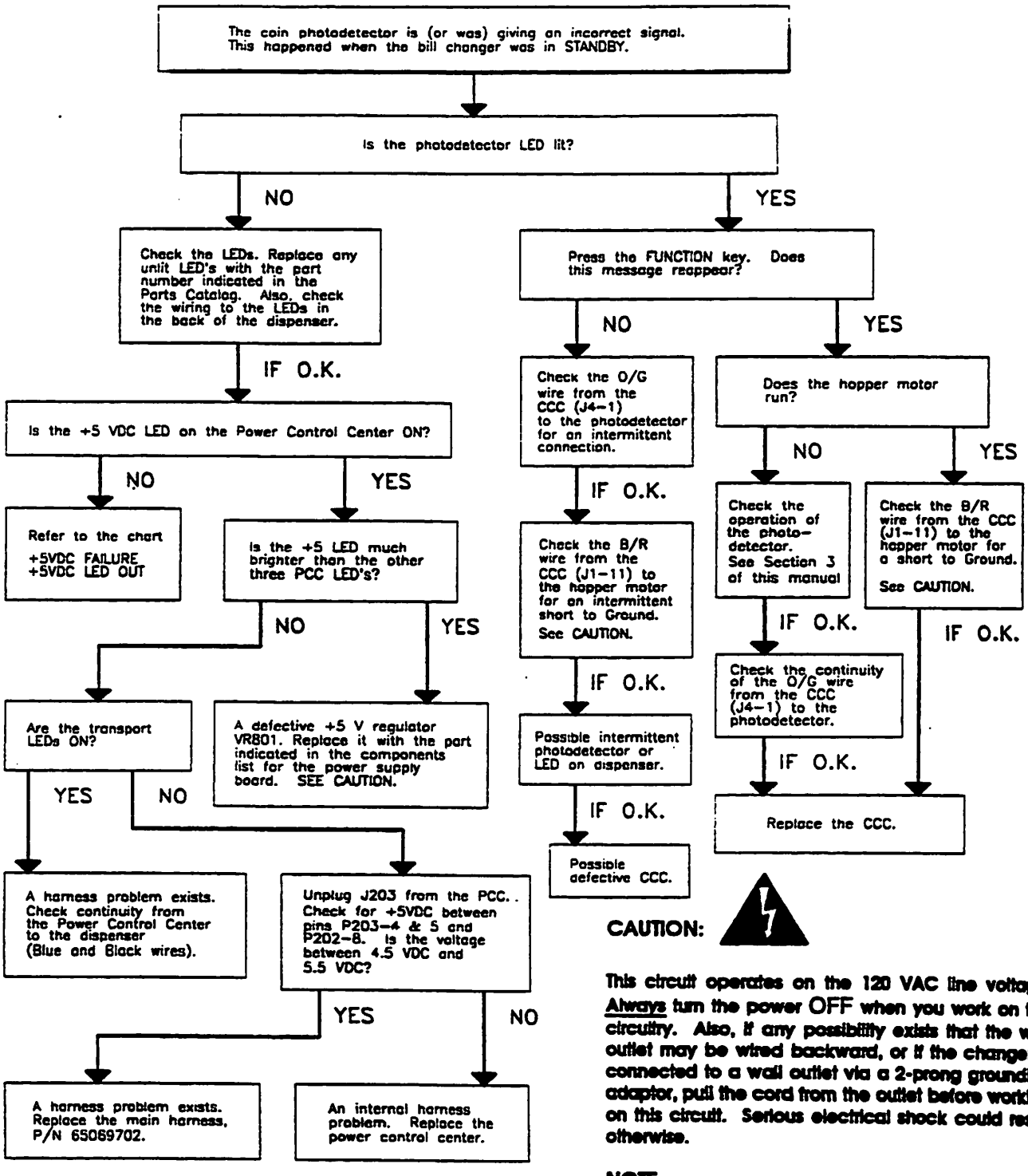
3. Press the FUNCTION key. If the message reappears, check for dirt on the left detector LED. If it is clean, check the coin photodetector. If it is OK, check the wiring from the photodetector to the CCC for an open connection or short to Ground. If no problems are found, replace the CCC.

4. If this message does not reappear after resetting the bill changer, check the wiring to the hopper motors and coin detectors. If no problems are found, replace the CCC. To restore the bill changer to operation, press the FUNCTION key after correcting the problem.

For a more complete troubleshooting sequence, refer to Troubleshooting Chart 030.

Chart 030 - Shutdown – Out Of Service Lamp Lit

Display shows: **CK L COIN DETCTR***


The coin photodetector is (or was) giving an incorrect signal. This happened when the bill changer was in STANDBY.
Is the photodetector LED lit?
NO
YES
Check the LEDs. Replace any unlit LED's with the part number indicated in the Parts Catalog. Also, check the wiring to the LEDs in the back of the dispenser.
IF O.K.
Is the +5 VDC LED on the Power Control Center ON?
NO
YES
Refer to the chart +5VDC FAILURE +5VDC LED OUT
Is the +5 LED much brighter than the other three PCC LED's?
NO
YES
Are the transport LEDs ON?
A defective +5 V regulator VR801. Replace it with the part indicated in the components list for the power supply board. SEE CAUTION.
YES
NO
A harness problem exists. Check continuity from the Power Control Center to the dispenser (Blue and Black wires).
Unplug J203 from the PCC. Check for +5VDC between pins P203-4 & 5 and P202-8. Is the voltage between 4.5 VDC and 5.5 VDC?
YES
NO
A harness problem exists. Replace the main harness, P/N 65069702.
An internal harness problem. Replace the power control center.
Press the FUNCTION key. Does this message reappear?
NO
YES
Check the O/G wire from the CCC (J4-1) to the photodetector for an intermittent connection.
IF O.K.
Check the B/R wire from the CCC (J1-11) to the hopper motor for an intermittent short to Ground. See CAUTION.
IF O.K.
Possible intermittent photodetector or LED on dispenser.
IF O.K.
Possible defective CCC.
Does the hopper motor run?
NO
YES
Check the operation of the photo-detector. See Section 3 of this manual
IF O.K.
Check the continuity of the O/G wire from the CCC (J4-1) to the photodetector.
IF O.K.
Check the B/R wire from the CCC (J1-11) to the hopper motor for a short to Ground. See CAUTION.
IF O.K.
Replace the CCC.

CAUTION:

This circuit operates on the 120 VAC line voltage. Always turn the power OFF when you work on this circuitry. Also, if any possibility exists that the wall outlet may be wired backward, or if the changer is connected to a wall outlet via a 2-prong grounding adaptor, pull the cord from the outlet before working on this circuit. Serious electrical shock could result otherwise.

NOTE:

If the +5 VDC LED is much brighter than the others, due to VR201 being defective, the transport coil LEDs, display LEDs, and photodetector LEDs could be burned out.

***If CK C COIN DETCTR, CK R COIN DETCTR, or CK COIN DETCTRS message appears, replace the CCC. There are no center or right detectors in the BC-150.**

L DETCTR ON LONG

Symptom:

While paying out coins, the detector was blocked too long.

Corrective Action:

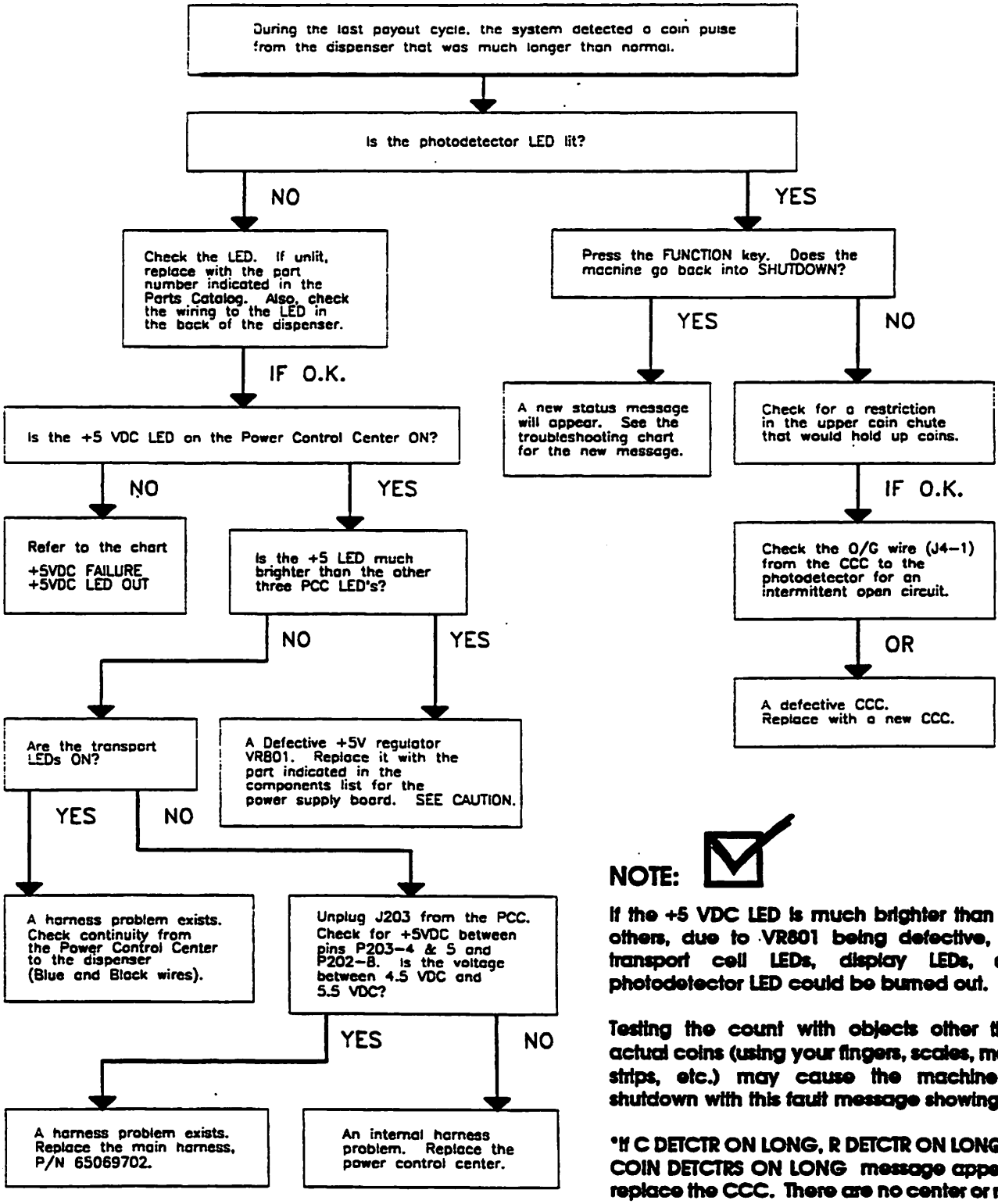
During the last payout cycle, the system detected a coin pulse from the dispenser that was much longer than normal.

1. The detector LED could have burned out during the replenish cycle. If the LED is lit, reset the bill changer and see if it goes back into SHUTDOWN. If so, refer to new status message that will appear.
2. If the bill changer stays in service, then check the photo detector and wiring. If no problem is found, replace the CCC.
3. Also, check the upper coin chute for anything that would hold a coin up.
4. If everything looks OK, replace the CCC.
5. To restore the bill changer to service, press the FUNCTION key after correcting the problem.

For a more complete troubleshooting sequence, refer to Troubleshooting Chart 040.

040 - Shutdown - Out Of Service Lamp Lit

Display shows: L DETCTR ON LONG*


During the last payout cycle, the system detected a coin pulse from the dispenser that was much longer than normal.
Is the photodetector LED lit?
NO
YES
Check the LED. If unlit, replace with the part number indicated in the Parts Catalog. Also, check the wiring to the LED in the back of the dispenser.
IF O.K.
Press the FUNCTION key. Does the machine go back into SHUTDOWN?
YES
NO
A new status message will appear. See the troubleshooting chart for the new message.
Check for a restriction in the upper coin chute that would hold up coins.
IF O.K.
Check the O/G wire (J4–1) from the CCC to the photodetector for an intermittent open circuit.
OR
A defective CCC. Replace with a new CCC.
Is the +5 VDC LED on the Power Control Center ON?
NO
YES
Refer to the chart
+5VDC FAILURE
+5VDC LED OUT
Is the +5 LED much brighter than the other three PCC LED's?
NO
YES
Are the transport LEDs ON?
A Defective +5V regulator VR801. Replace it with the part indicated in the components list for the power supply board. SEE CAUTION.
YES
NO
A harness problem exists. Check continuity from the Power Control Center to the dispenser (Blue and Black wires).
Unplug J203 from the PCC. Check for +5VDC between pins P203–4 & 5 and P202–8. Is the voltage between 4.5 VDC and 5.5 VDC?
YES
NO
A harness problem exists. Replace the main harness, P/N 65069702.
An internal harness problem. Replace the power control center.

NOTE:

If the +5 VDC LED is much brighter than the others, due to VR801 being defective, the transport coil LEDs, display LEDs, and photodetector LED could be burned out.

Testing the count with objects other than actual coins (using your fingers, scales, metal strips, etc.) may cause the machine to shutdown with this fault message showing.

***If C DETCTR ON LONG, R DETCTR ON LONG, or COIN DETCTRS ON LONG message appears, replace the CCC. There are no center or right detectors in the BC-150.**

EXTRA COIN-L HOP

Symptom:

Since last time bill changer was reset, the bill changer may have dispensed two more coins than it should have during the payout cycle.

Corrective Action:

1. Most likely, the problem is not electrical. Probable causes are: Dirt buildup in the hopper, a faulty hopper motor brake, or worn parts in the hopper or hopper motor.

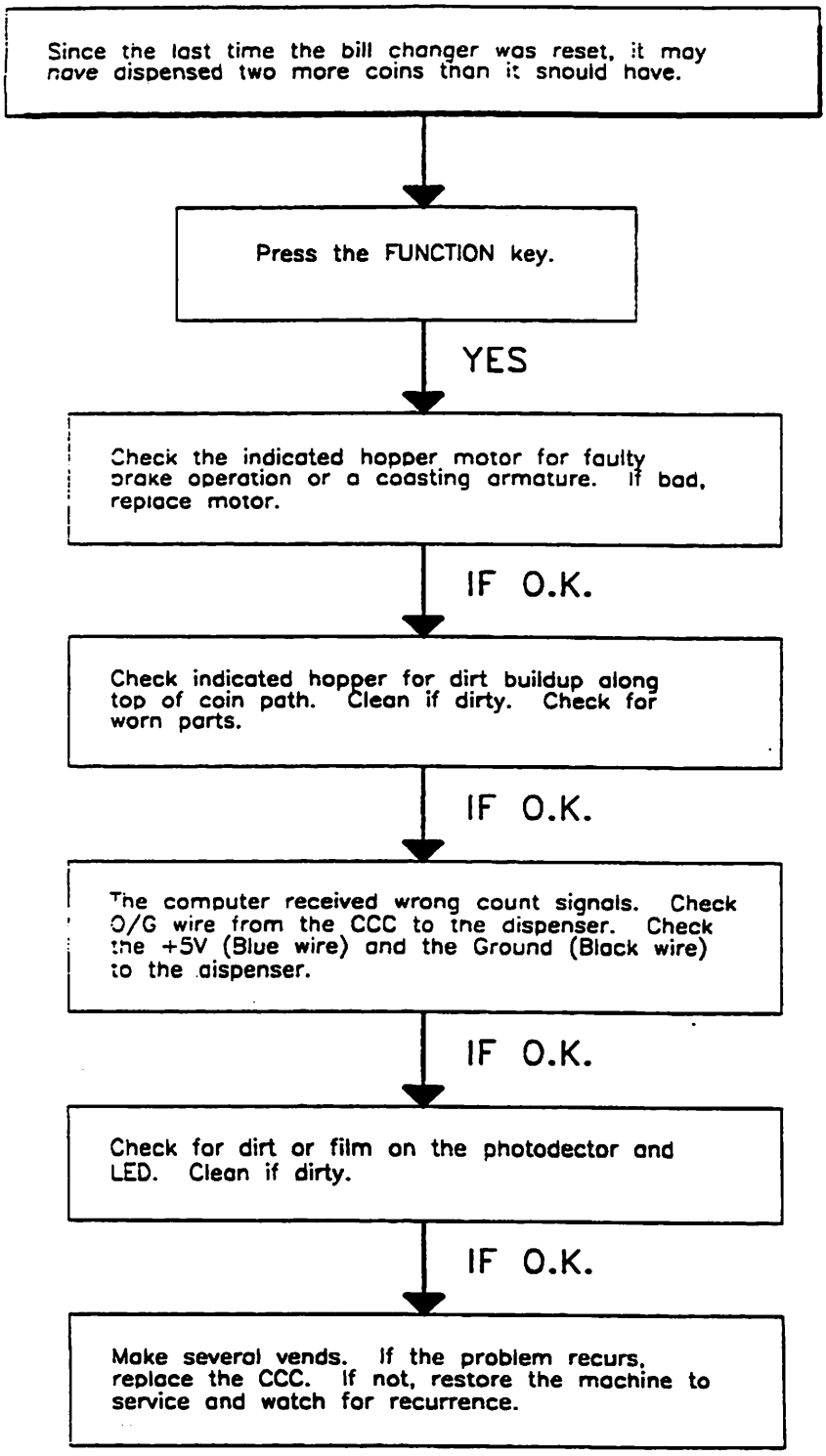
2. Also, the possible cause could be intermittent connections to the coin detector, detector LED, or wiring.

3. To restore the bill changer to operation, press the FUNCTION key after correcting the problem.

For a more complete troubleshooting sequence, refer to Troubleshooting Chart 050.

Chart 050 - Shutdown - Out Of Service Lamp Lit

Display shows: **EXTRA COIN L HOP**


Since the last time the bill changer was reset, it may have dispensed two more coins than it should have.
Press the FUNCTION key.
YES
Check the indicated hopper motor for faulty brake operation or a coasting armature. If bad, replace motor.
IF O.K.
Check indicated hopper for dirt buildup along top of coin path. Clean if dirty. Check for worn parts.
IF O.K.
The computer received wrong count signals. Check O/G wire from the CCC to the dispenser. Check the +5V (Blue wire) and the Ground (Black wire) to the dispenser.
IF O.K.
Check for dirt or film on the photodector and LED. Clean if dirty.
IF O.K.
Make several vends. If the problem recurs, replace the CCC. If not, restore the machine to service and watch for recurrence.

NOTE: ☑

Testing the count with objects other than actual coins (fingers, scales, metal strips, etc.) may cause the machine to shutdown with this fault code showing.

L HOPPER EMPTY

Symptom:

The hopper is empty.

Corrective Action:

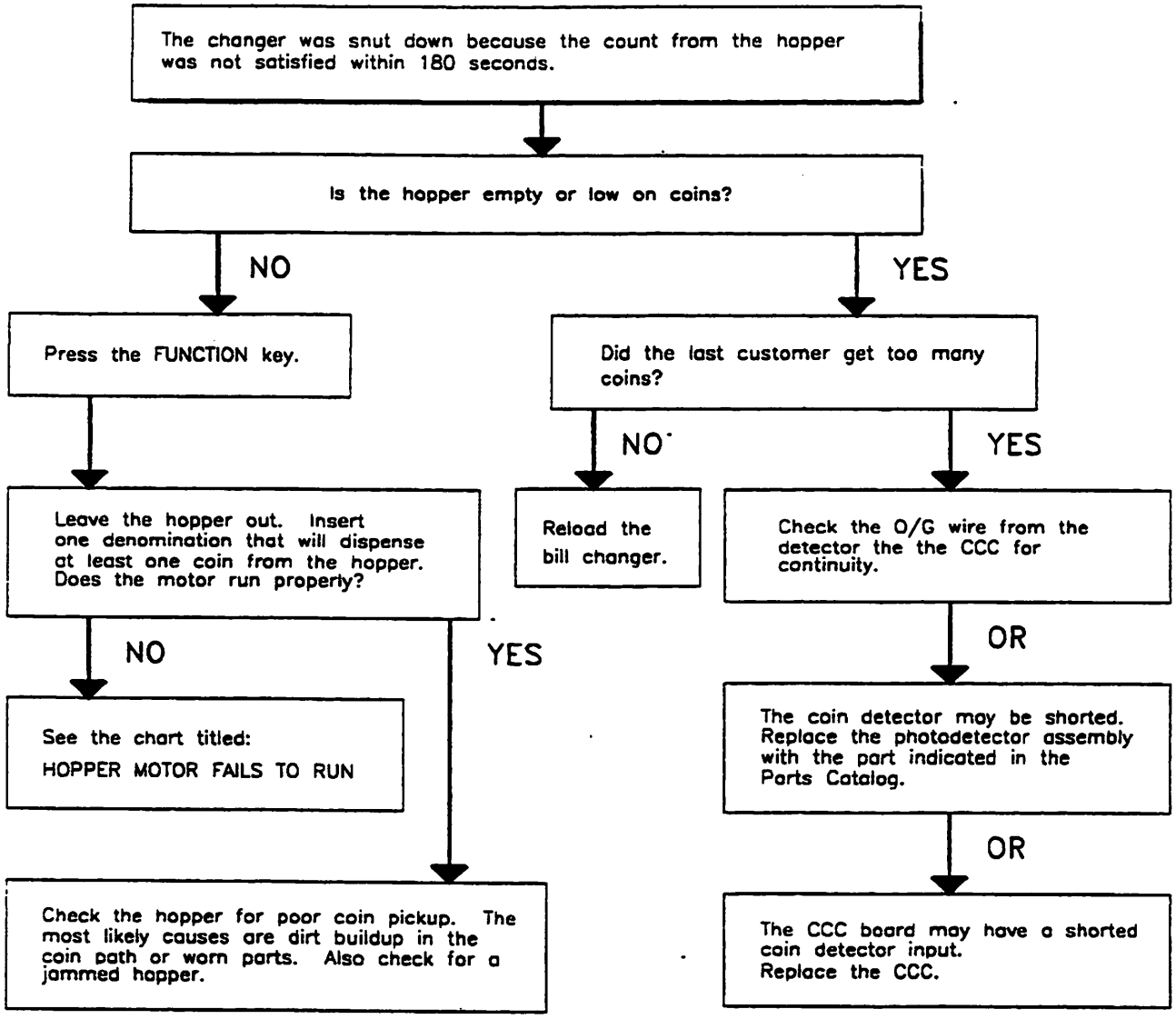
The bill changer was shutdown because the count from the hopper was not satisfied within 180 seconds.

1. Check the hopper. If not empty or low on coins, check for dirt buildup on the coin path or a jammed hopper.
2. Check the coin detector or the wiring to the detector. If this checks OK, replace the CCC.
3. Reset the bill changer and insert a bill. See if the hopper runs. If the motor does not run, check the motor and wiring to it. If OK, replace the CCC.
4. To restore the bill changer to operation, press the FUNCTION key after correcting the problem.

For a more complete troubleshooting sequence, refer to Troubleshooting Chart 060.

060 - Shutdown - Out Of Service Lamp Lit

Display shows: L **HOPPER EMPTY**


The changer was snut down because the count from the hopper was not satisfied within 180 seconds.
Is the hopper empty or low on coins?
NO
YES
Press the FUNCTION key.
Did the last customer get too many coins?
NO
YES
Leave the hopper out. Insert one denomination that will dispense at least one coin from the hopper. Does the motor run properly?
Reload the bill changer.
Check the O/G wire from the detector the the CCC for continuity.
NO
YES
OR
See the chart titled: HOPPER MOTOR FAILS TO RUN
The coin detector may be shorted. Replace the photodetector assembly with the part indicated in the Parts Catalog.
OR
Check the hopper for poor coin pickup. The most likely causes are dirt buildup in the coin path or worn parts. Also check for a jammed hopper.
The CCC board may have a shorted coin detector input. Replace the CCC.

CK STACKER

Symptom:

The stacker did not return to the HOME position.

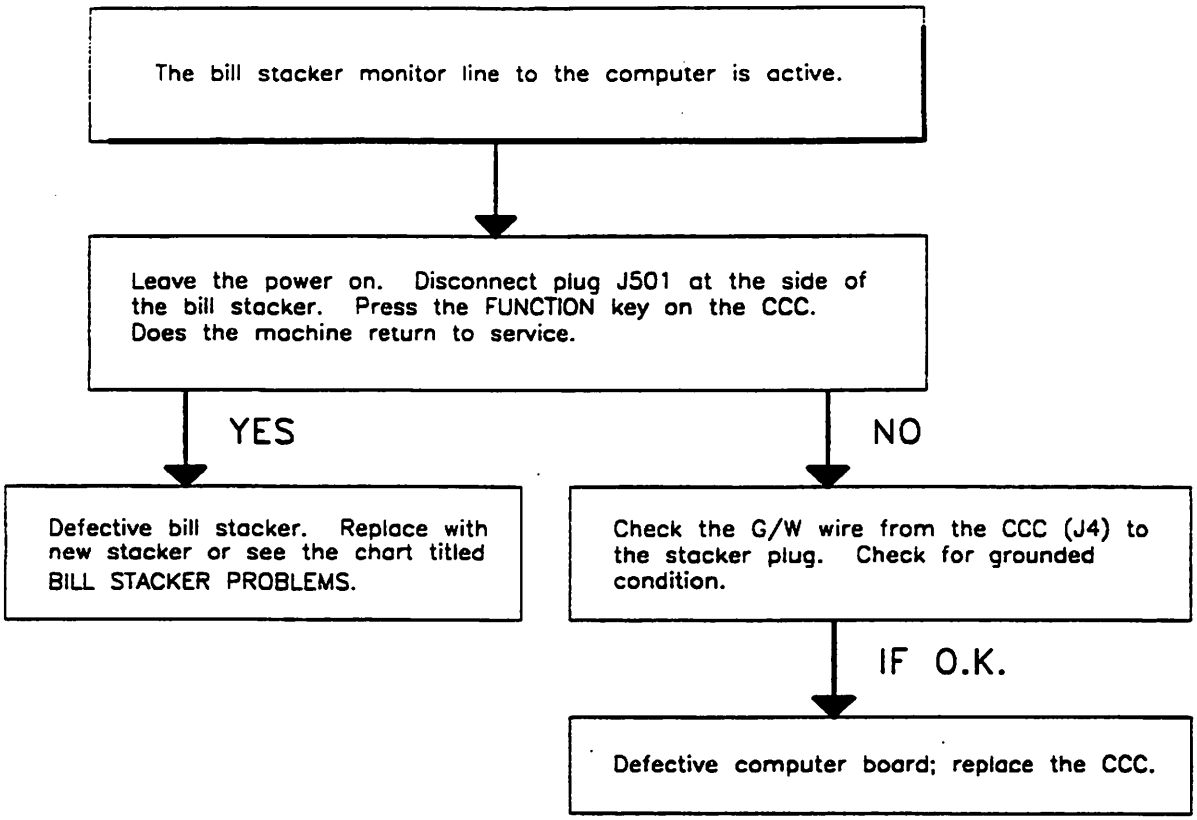
If machine is in SHUTDOWN and this message is showing, the bill stacker monitor input is active.

1. Leave the power ON. Disconnect the main harness at the bill stacker. Press the FUNCTION key.
2. If the message disappears, replace the bill stacker. If the message reappears, check the stacker monitor line (Green/White wire) from the stacker plug to the CCC for a short to the chassis.
3. The stacker cam switches may be out of adjustment, the stacker relay may be stuck, the stacker motor brake may be stuck, or the motor itself may be defective.
4. If wiring is OK, replace the control computer.
5. To restore machine to operation, press the FUNCTION key after correcting problem.

For a more complete troubleshooting sequence, refer to Troubleshooting Chart 070.

Chart 070 - Shutdown - Out Of Service Lamp Lit

Display shows: **CK STACKER**


The bill stacker monitor line to the computer is active.
Leave the power on. Disconnect plug J501 at the side of the bill stacker. Press the FUNCTION key on the CCC. Does the machine return to service.
YES
NO
Defective bill stacker. Replace with new stacker or see the chart titled BILL STACKER PROBLEMS.
Check the G/W wire from the CCC (J4) to the stacker plug. Check for grounded condition.
IF O.K.
Defective computer board; replace the CCC.

NOTE: ☑

Machine can be restored to service by turning the power OFF and correcting the problem (In some cases the FUNCTION key may have to be pressed.)

ERROR ??

Symptom:

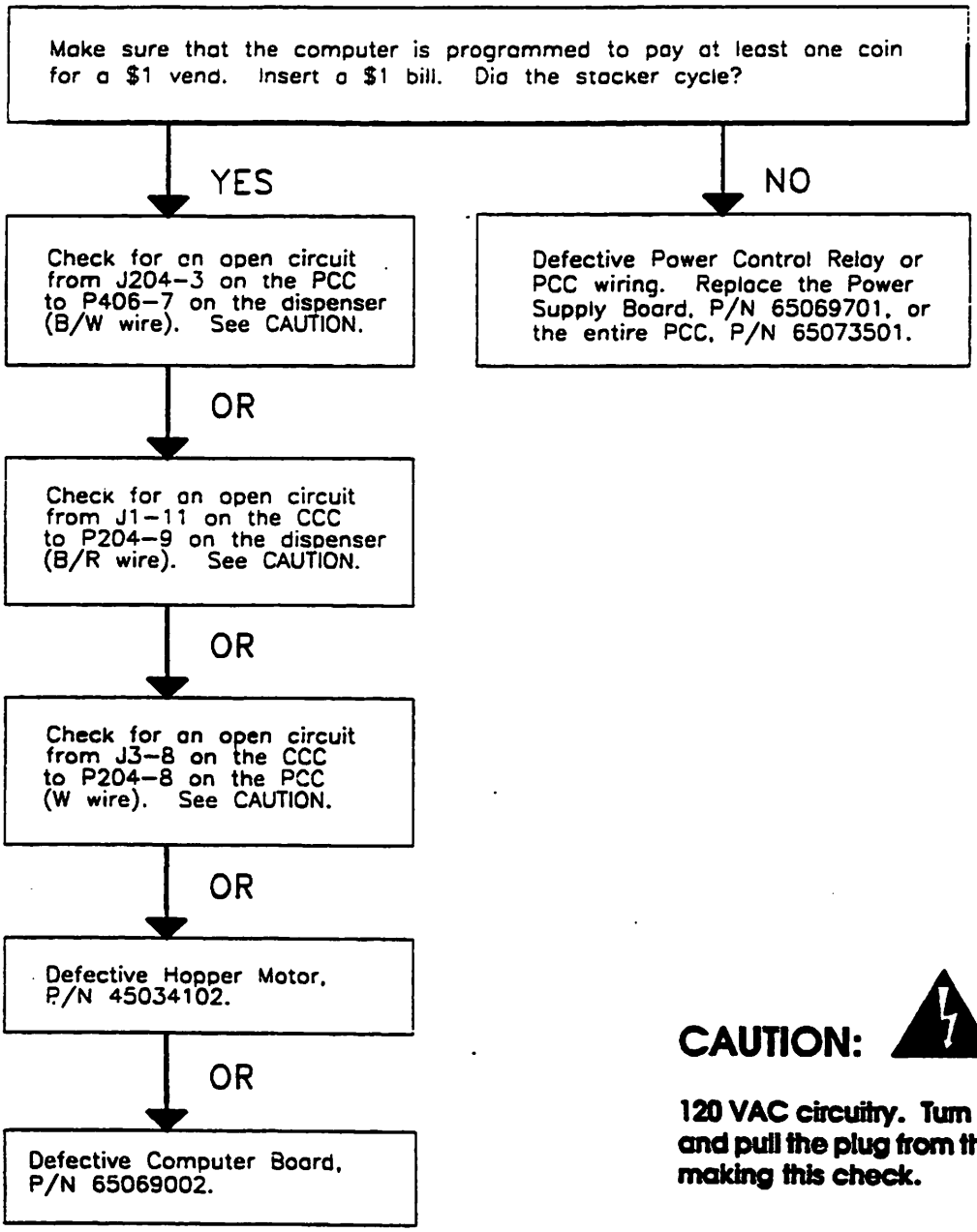
Unknown error code xxx.

Corrective Action:

The changer detected an unknown error.

1. Press the FUNCTION key to reset the bill changer.
2. Run a few bills and check for proper operation.
3. If the error returns, replace the CCC.
4. If OK, put the changer back in service and watch for recurrence of the error.

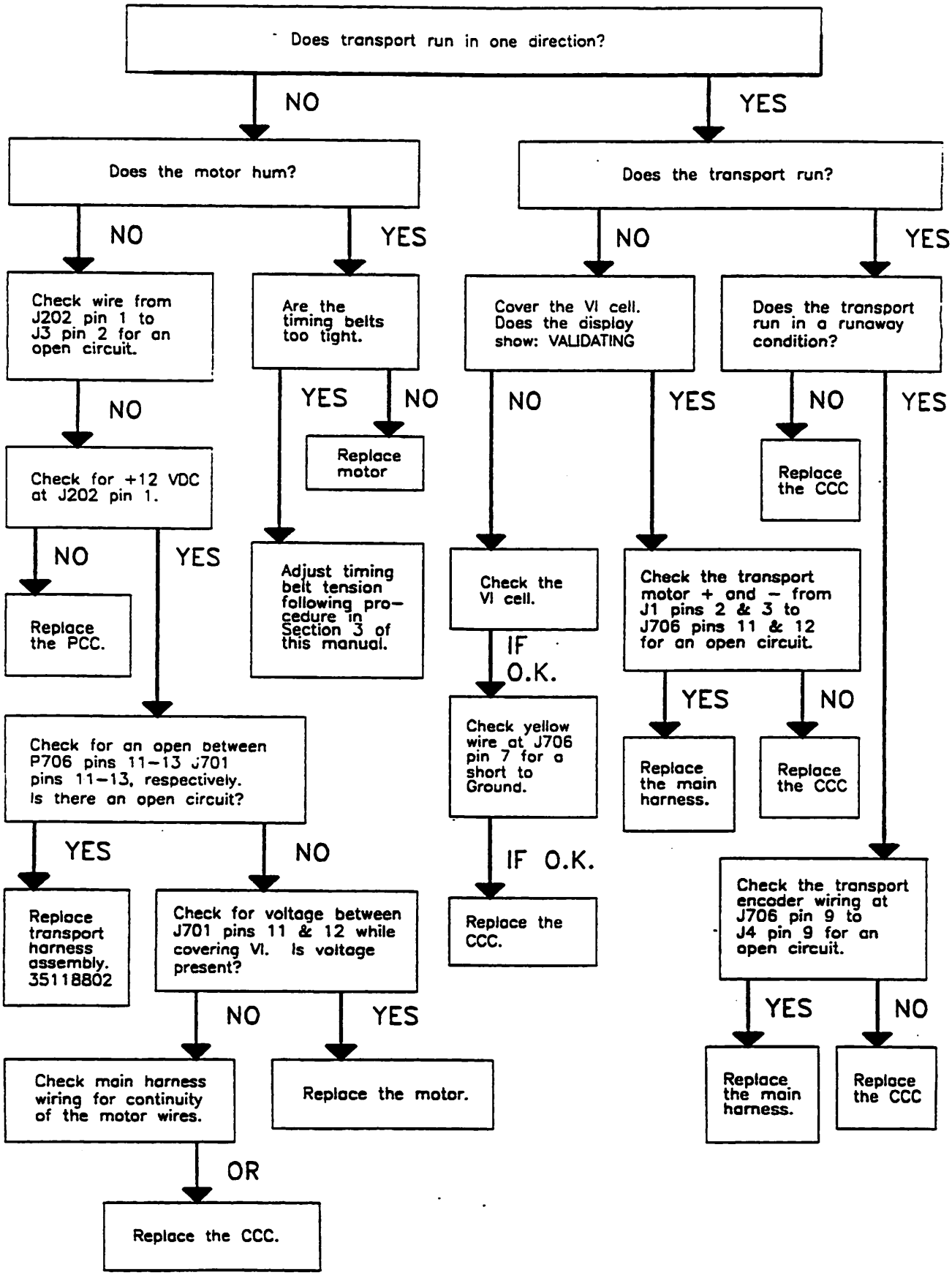
Hopper Motor Fails To Run


Make sure that the computer is programmed to pay at least one coin for a $1 vend. Insert a $1 bill. Did the stacker cycle?
YES
NO
Check for an open circuit from J204–3 on the PCC to P406–7 on the dispenser (B/W wire). See CAUTION.
Defective Power Control Relay or PCC wiring. Replace the Power Supply Board, P/N 65069701, or the entire PCC, P/N 65073501.
OR
Check for an open circuit from J1–11 on the CCC to P204–9 on the dispenser (B/R wire). See CAUTION.
OR
Check for an open circuit from J3–8 on the CCC to P204–8 on the PCC (W wire). See CAUTION.
OR
Defective Hopper Motor, P/N 45034102.
OR
Defective Computer Board, P/N 65069002.

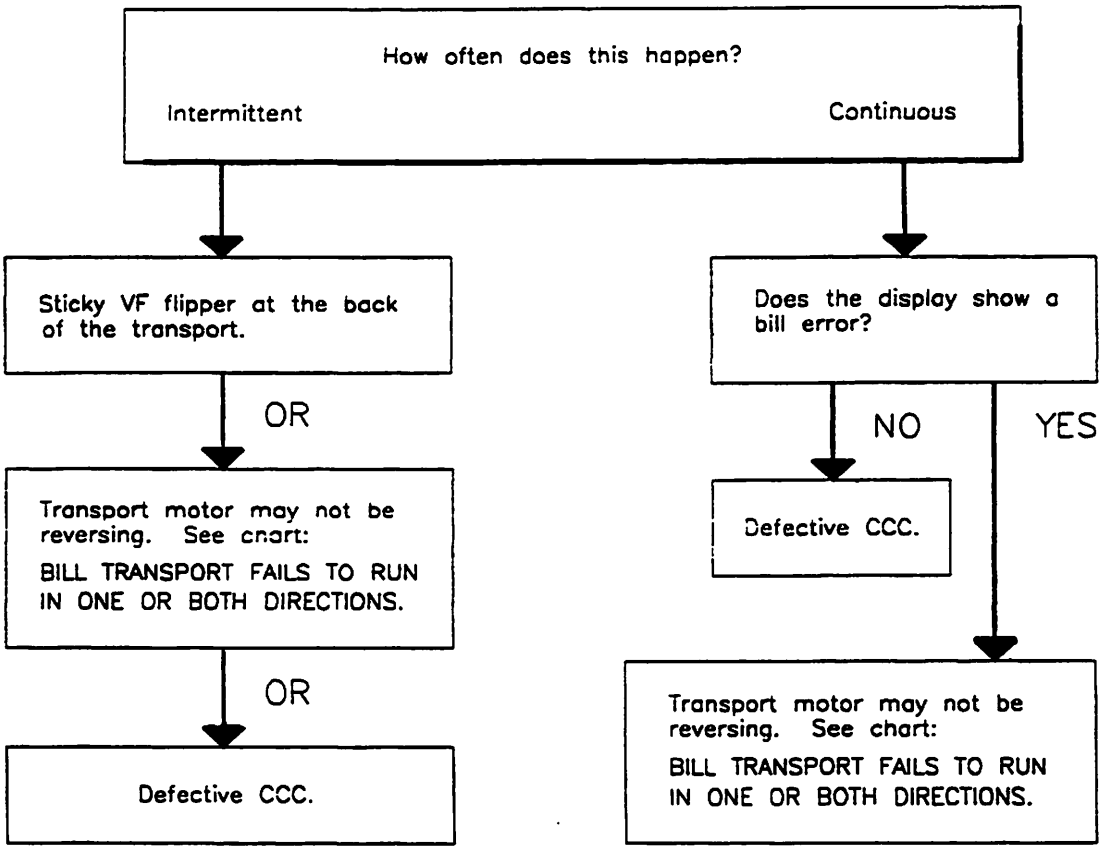
CAUTION:

120 VAC circuitry. Turn the power off and pull the plug from the wall before making this check.

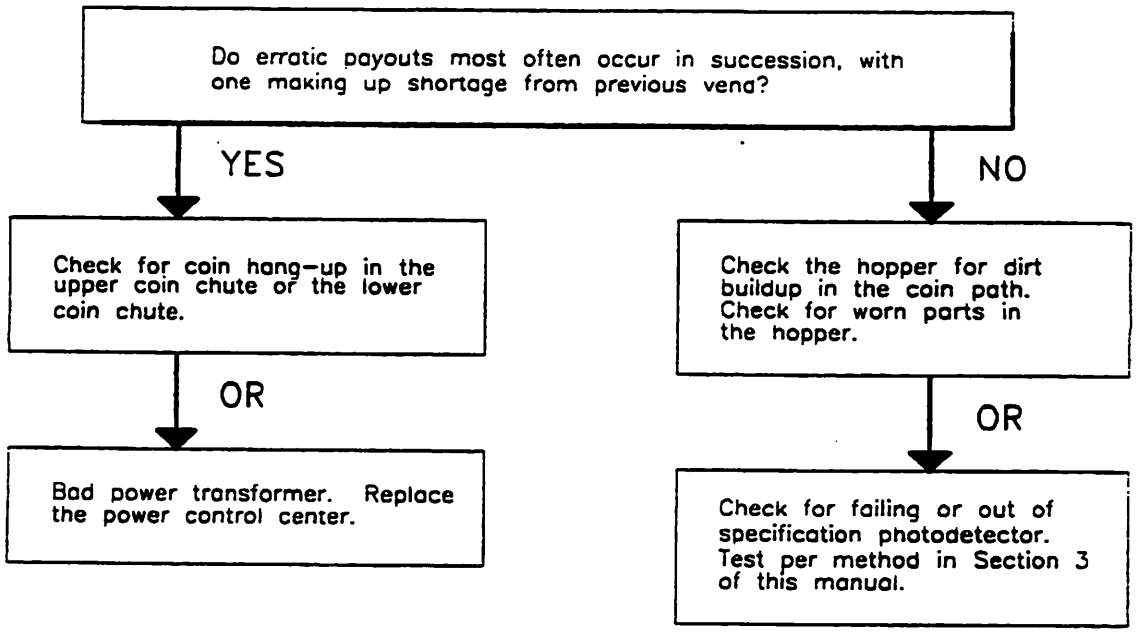
Bill Transport Fails To Run In One Or Both Directions


Does transport run in one direction?
NO
YES
Does the motor hum?
Does the transport run?
NO
YES
NO
YES
Check wire from J202 pin 1 to J3 pin 2 for an open circuit.
Are the timing belts too tight.
Cover the VI cell. Does the display show: VALIDATING
Does the transport run in a runaway condition?
NO
YES
YES
NO
NO
YES
NO
YES
Check for +12 VDC at J202 pin 1.
Replace motor
Replace the CCC
NO
YES
Replace the PCC.
Adjust timing belt tension following procedure in Section 3 of this manual.
Check the VI cell.
Check the transport motor + and − from J1 pins 2 & 3 to J706 pins 11 & 12 for an open circuit.
IF O.K.
YES
NO
Check for an open between P706 pins 11−13 J701 pins 11−13, respectively. Is there an open circuit?
Check yellow wire at J706 pin 7 for a short to Ground.
Replace the main harness.
Replace the CCC
YES
NO
IF O.K.
Check the transport encoder wiring at J706 pin 9 to J4 pin 9 for an open circuit.
Replace transport harness assembly. 35118802
Check for voltage between J701 pins 11 & 12 while covering VI. Is voltage present?
Replace the CCC.
YES
NO
NO
YES
Check main harness wiring for continuity of the motor wires.
Replace the motor.
Replace the main harness.
Replace the CCC
OR
Replace the CCC.

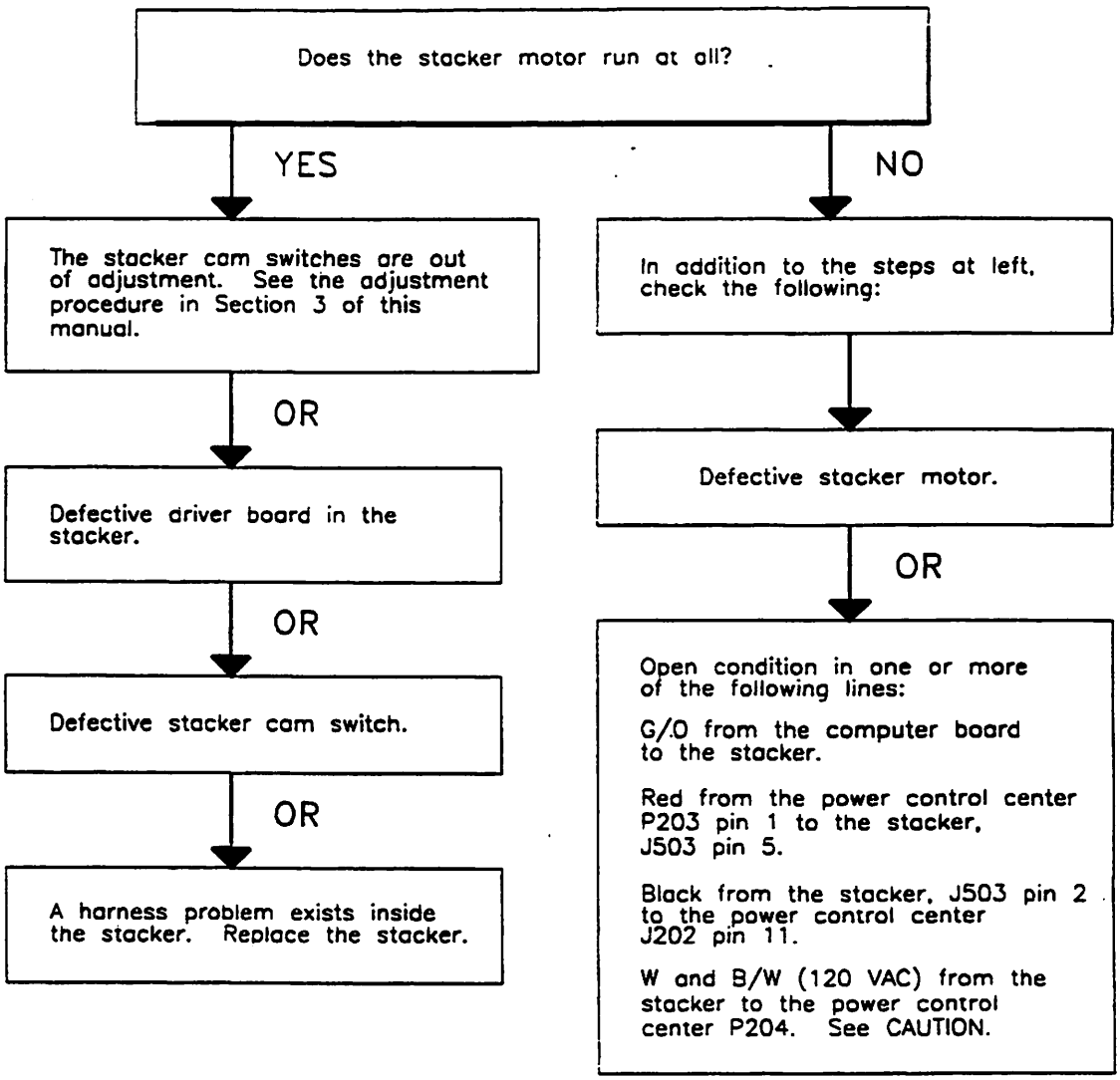
Bill Changer Steals Bills


How often does this happen?
Intermittent
Continuous
Sticky VF flipper at the back of the transport.
OR
Transport motor may not be reversing. See chart:
BILL TRANSPORT FAILS TO RUN IN ONE OR BOTH DIRECTIONS.
OR
Defective CCC.
Does the display show a bill error?
NO
YES
Defective CCC.
Transport motor may not be reversing. See chart:
BILL TRANSPORT FAILS TO RUN IN ONE OR BOTH DIRECTIONS.

Bill Changer Gives Erratic Payout For Bills No Error Messages


Do erratic payouts most often occur in succession, with one making up shortage from previous vend?
YES
NO
Check for coin hang-up in the upper coin chute or the lower coin chute.
OR
Bad power transformer. Replace the power control center.
Check the hopper for dirt buildup in the coin path. Check for worn parts in the hopper.
OR
Check for failing or out of specification photodetector. Test per method in Section 3 of this manual.

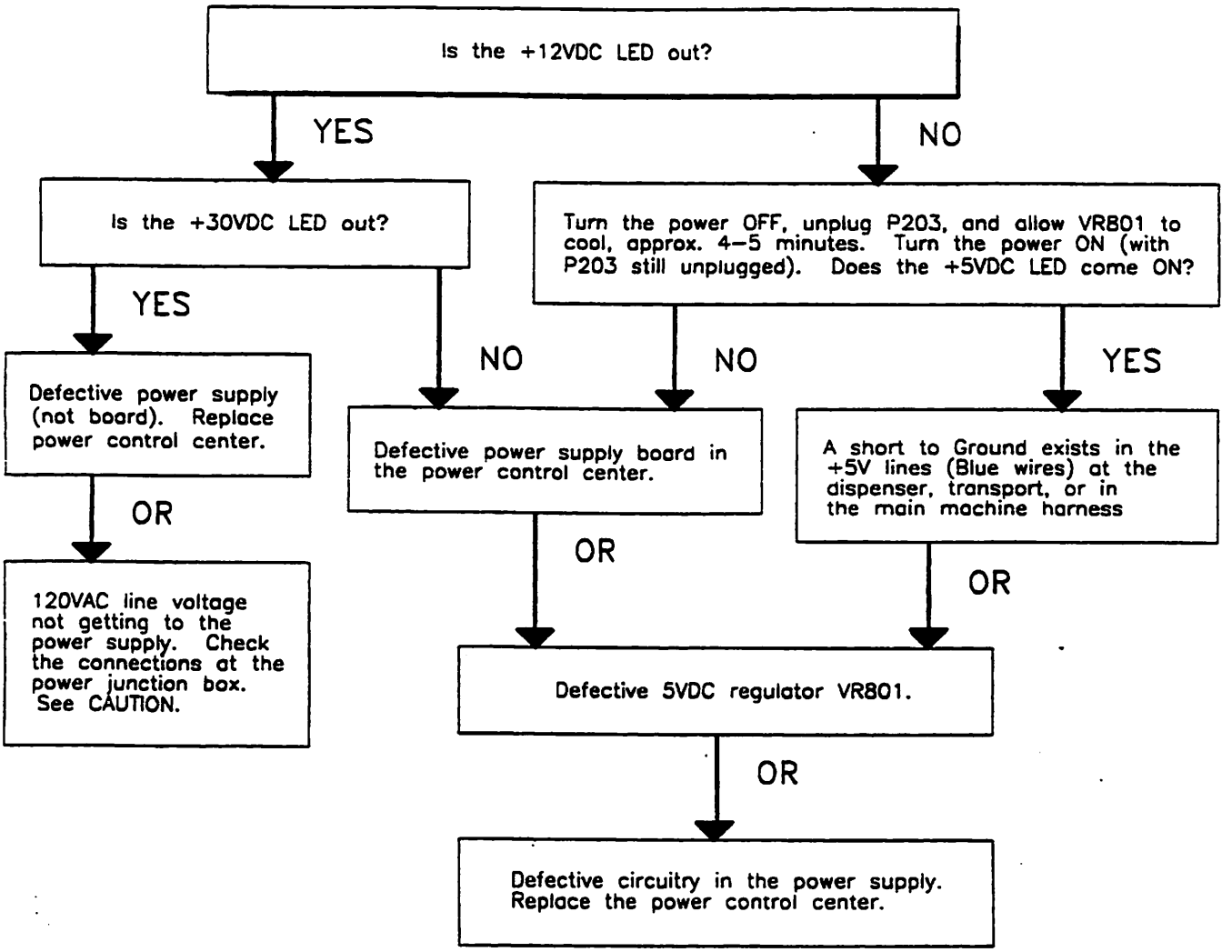
Bill Stacker Problems


Does the stacker motor run at all?
YES
NO
The stacker cam switches are out of adjustment. See the adjustment procedure in Section 3 of this manual.
OR
Defective driver board in the stacker.
OR
Defective stacker cam switch.
OR
A harness problem exists inside the stacker. Replace the stacker.
In addition to the steps at left, check the following:
Defective stacker motor.
OR
Open condition in one or more of the following lines:
G/O from the computer board to the stacker.
Red from the power control center P203 pin 1 to the stacker, J503 pin 5.
Black from the stacker, J503 pin 2 to the power control center J202 pin 11.
W and B/W (120 VAC) from the stacker to the power control center P204. See CAUTION.

CAUTION:

120 VAC circuitry. Turn the power off and pull the plug from the wall before making this check.

+5 VDC Failure, +5 VDC LED Out


Is the +12VDC LED out?
YES
NO
Is the +30VDC LED out?
Turn the power OFF, unplug P203, and allow VRB01 to cool, approx. 4–5 minutes. Turn the power ON (with P203 still unplugged). Does the +5VDC LED come ON?
YES
NO
NO
YES
Defective power supply (not board). Replace power control center.
Defective power supply board in the power control center.
A short to Ground exists in the +5V lines (Blue wires) at the dispenser, transport, or in the main machine harness
OR
OR
OR
120VAC line voltage not getting to the power supply. Check the connections at the power junction box. See CAUTION.
Defective 5VDC regulator VR801.
OR
Defective circuitry in the power supply. Replace the power control center.

CAUTION:

120 VAC circuitry. Turn the power off and pull the plug from the wall before making this check.

DETAILED CCC BOARD OPERATION

The following description is not intended for the casual repair man or the novice technician. It details the electronics found on the CCC board. No attempt should be made to repair this board unless you have had considerable experience trouble shooting and repairing complex, microprocessor controlled electronic circuit boards. Rowe suggests that you send any defective CCC boards back to the factory for proper servicing.

Figure 4-6 is a four sheet schematic of the BC-150 Changer Control Computer board. Sheet 1 shows the microprocessor, memory and address decoding circuits. Sheet 2 shows the 16 character alpha-numeric display and its control circuits. Sheet 3 shows the output interface circuits. Sheet 4 shows the input interface circuits.

Sheet 1: Control Computer

U20 is a 8097 microprocessor. It has eight channels of analog-to-digital conversion on it used to process analog signals coming from the transport. There are also a number of special high speed input and output pins along with several I/O port pins.

RESET CIRCUIT

The reset circuit is based on U21, which is a low voltage detector circuit. Voltage is applied to Pin 2 from the 5 volt regulator VR1. When the input voltage on Pin 2 reaches the proper level, the Reset output on Pin 1 goes HIGH. When Reset goes HIGH, U20 Pin 16 also goes HIGH taking the processor out of reset. Reset also goes to the base of Q18 which controls RAM selection, battery power and the switched 12 volt source.

With U21 Pin 1 low (RESET active), Q18 is OFF. R74 will pull down the bases of Q9, Q17, and Q20 keeping all three turned off.

With Q9 off, the RAM chip select from U12A Pin 3 is blocked from reaching the RAM, U10. R73 pulls the RAM chip select up and keeps it de-selected.

With Q17 off, Q15 stays off allowing the battery voltage to be applied to the RAM, U10 Pins 26 and 28 through R150. The battery voltage will allow the RAM to retain its memory during reset and whenever there is no power applied to the board.

With Q18 off, Q20 is kept off by R107 which in turn keeps Q13 off which leaves the switched 12 volt supply off.

When U21 Pin 1 goes high (RESET not active), Q18 supplies +5 volts to the bases of Q9, Q17, and Q18 turning each of them on.

With Q9 on, the RAM chip select from U12A Pin 3 is allowed to pass through Q9 and be applied to the RAM U10 Pin 20. When Q9 is on, it effectively becomes transparent.

With Q17 on, the base of Q15 is pulled down turning on Q15. When Q15 is on, the +5 volt supply is applied to the RAM U10 Pins 26 and 28 through Q15 relieving the battery.

With Q18 on, voltage is applied to R157 providing a pull up for Q20. In this case, U20 Pin 30 through Q19 is the controlling factor. When U20 Pin 30 is high, Q19 is turned on which keeps Q20 off which in turn keeps Q13 and the switched 12 volt supply off. When U20 Pin 30 is low, Q19 turns off allowing Q20 to turn on through the pull up R157. This turns on Q13 and the switched 12 volt supply.

ADDRESS AND DATA

The 8097 processor has a multiplexed address and data bus for the low order address and all eight data lines. Those lines are designated AD0 through AD7. They leave the processor on a common bus and run to U9. U9 is a latch that separates the lower address bits. When the processor is to access a memory location, it first puts the low order address on AD0-AD7 then it toggles the ALE line (Pin 60 on U20), which latches the low order addresses on the output of U9 and establishes those addresses to the ROM, the RAM, and the other port chips.

The high order address lines (A15, A14, and A13) are decoded and used to select particular devices. Address line A15 alone is used to select the programmed EPROM, U18. EPROM memory occupies addresses 0000 through 7FFF hex. U18 contains the program that controls the changer. U12A takes signals A14 and A15 together to select the RAM. The RAM address is C000 through FFFF hex. There is another decoder chip at U13, which takes address lines A13, A14 and A15, decodes them, and selects the input and output buffers.

I/O PORTS

U8 is an input buffer decoded by U13 at address 8000 hex on a processor read cycle only. This port reads the NORMAL/PROGRAM mode switch, all push button switches and the machine code information. When the processor reads memory location 8000, the information on the switches will be brought into the processor.

U19 is an input buffer decoded by U13 at address A000 hex on a processor read cycle only. This port reads the Test switches, coin switches, and dispenser coin detectors. When the processor reads memory location A000, the information on these devices will be brought into the processor.

U5 is an output latch decoded by U13 at address 8000 hex on a processor write cycle only. U5 controls the hopper motors, the stacker, and coin lockout coil. The interface circuits for these functions are contained on sheet 3.

U16 is an RS485 interface chip allowing communication to test equipment and the Rowe BC programming aid.

U15 is an EEPROM used to store information that must be kept, even if the battery voltage to the RAM dies. Original date of manufacturer along with other things are stored in the EEPROM.

Sheet 2: Digital Display Diver

DS1 is the vacuum florescent display. It normally requires a negative supply voltage to operate. The bill changer does not provide a negative supply so the display tube and the display driver chip U1 are both "floating", that is, they do not have a direct ground reference. This effectively simulates a negative supply.

R17 through R22 provide level shifting of the display clock, data, and reset control lines. Each pair of resistors sets up a voltage divider allowing the digital input signals on U14 to be level shifted to the voltages needed by U1.

When investigating this area, verify the proper voltages developed by the zener diodes. Referencing all measurements to ground, U1 Pin 1 should be +30 VDC, U1 Pin 18 should be +14 VDC. DS1 Pin 1 should be +6.2 VDC and DS1 Pin 34 should be +11.8 VDC. Voltages on U1 Pins 20, 21, and 22 should swing between +30 VDC and +20 VDC.

Sheet 3: Output Circuits

All output circuits except the transport transmissive/reflective LED drive circuit, are inactive when the switched +12 VDC supply is off. This keeps all the motors, solenoids, and coils in the machine from operating when the machine is turned on and off, or whenever the RESET line from U21 is low.

TRANSPORT MOTOR CONTROL

The transport motor drive comes in to U6B Pin 3. U6B buffers the signal and inverts it through U11G applying it to the base of Q5. The transport motor is a DC motor that runs on +12 volts. Motor speed is controlled by switching Q5 on and off based on the transport motor drive signal. The transport drive signal is not a constant DC voltage applied to the base of Q5 but a switching signal. If the motor is running too fast, Q5 is turned off; if the motor is running too slow, Q5 is turned back on.

The transport motor direction is controlled through relay K1. When the relay is in the normal de-energized position, as shown on the schematic, the motor will run in reverse when Q5 is turned on. The transport motor runs in the forward direction when relay K1 is energized. The transport motor direction comes from the processor on Sheet 1 into Pin 5 of U6. It is inverted through U7, then applied to relay K1. Diode D2 suppresses back EMF from K1's coil as it de-energizes. D6 and D7 do the same thing for the motor coils when the motor is turned off.

HOPPER MOTOR CONTROL

A low at U11A Pin 1 causes Pin 16 to turn off. No current flows through the LED half of U4 so no gate current is provided to Q3. Without gate current, Q3 stays off keeping the hopper motor off. When U11A Pin 1 goes high, Pin 16 switches to ground turning on the LED in U4. Current flows in U4 Pins 4 and 6 supplying current to the base on Q3 turning Q3 on. When Q3 in on, the hopper motor will run.

WARNING:

The hopper motor runs on 120 VAC and can cause severe electrical shock. Be very careful whenever you work with these circuits.

LED DRIVE

The LED drive signal controls the intensity of the reflective- transmissive LED in the transport. The light is similar to the transport motor in that it is not driven from a constant DC voltage, but is pulsed. If you look at the LED in the transport it looks like it is on constant, but it is not, it is pulsing. By changing the duty cycle of the pulse, the brightness of the led can be controlled.

OUT OF SERVICE LAMP

The OUT OF SERVICE lamp is controlled by the switched +12 VDC supply through U7G Pins 7 and 10. Whenever the switched +12 VDC supply is on, the power control relay is energized and the OUT OF SERVICE lamp is off. Whenever the switched 12 VDC supply is turned off, the power control relay de-energizes and OUT OF SERVICE lamp will be lit.

STACKER DRIVE

The stacker drive signal through U12D and U14E is applied to the stacker control board in the stacker. The stacker drive signal is a 200ms pulse, just long enough to start the stacker motor and move it off its home switch.

DOLLAR ACCEPTED COUNTER

The dollar counter is controlled by signals sent through U6D and U7F. A high on U6D Pin 9 turns the counter on while a low on U6D Pin 9 turns the counter off. The counter is pulsed 50ms on, 50ms off when counting.

Sheet 4: Input Circuits

Most of the input circuits are straight forward. A series resistor, usually 100 ohms or 1K ohms, and either a .01 or .1 microfarad capacitor to ground provide a little noise filtering. Several inputs have pull up resistors.

Seven inputs from P4 are connected to A/D conversion inputs on the processor. All the other inputs are digital signals. The circuits involving U17A, U17B, Q14, and Q16 convert analog inputs to digital signals.

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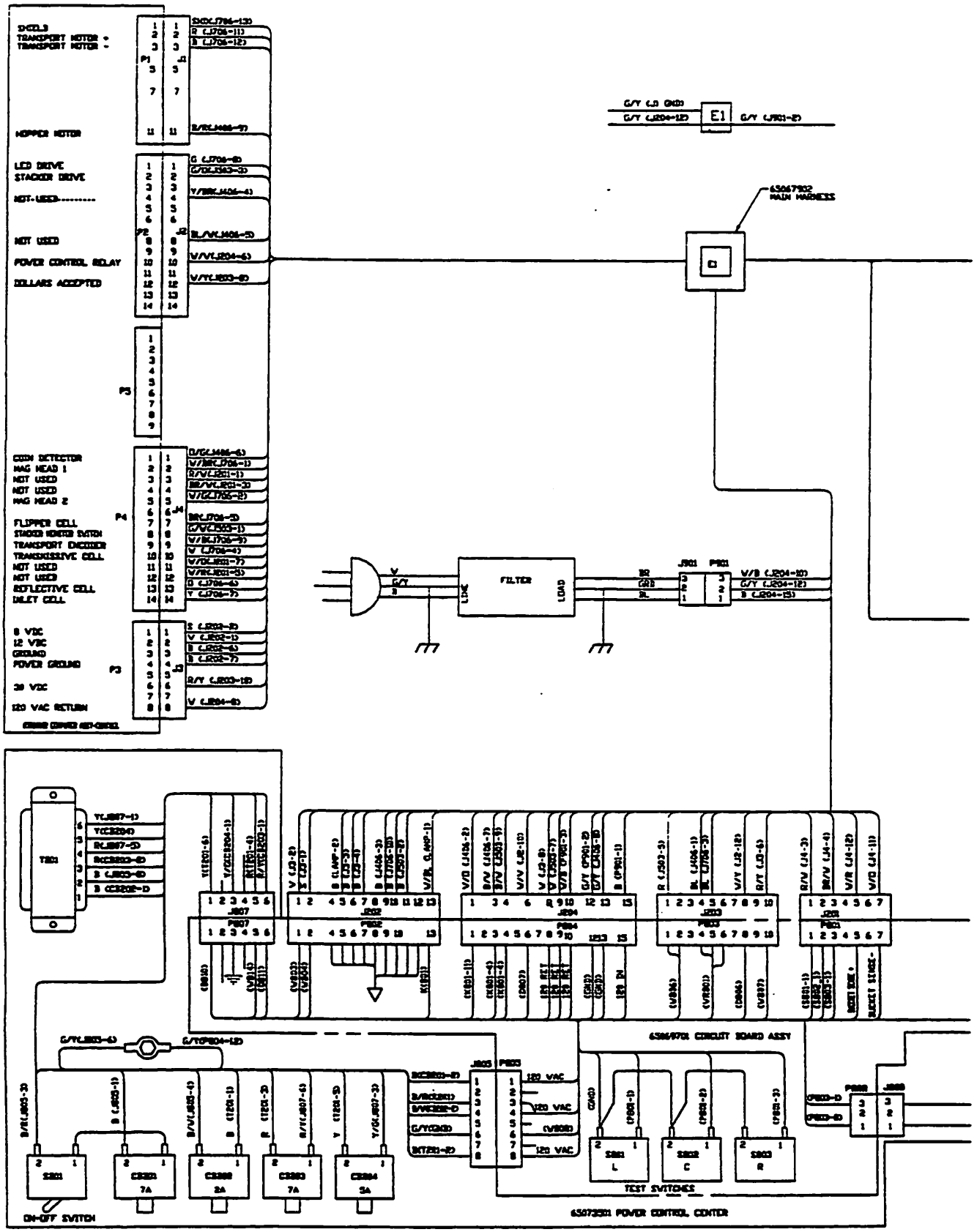
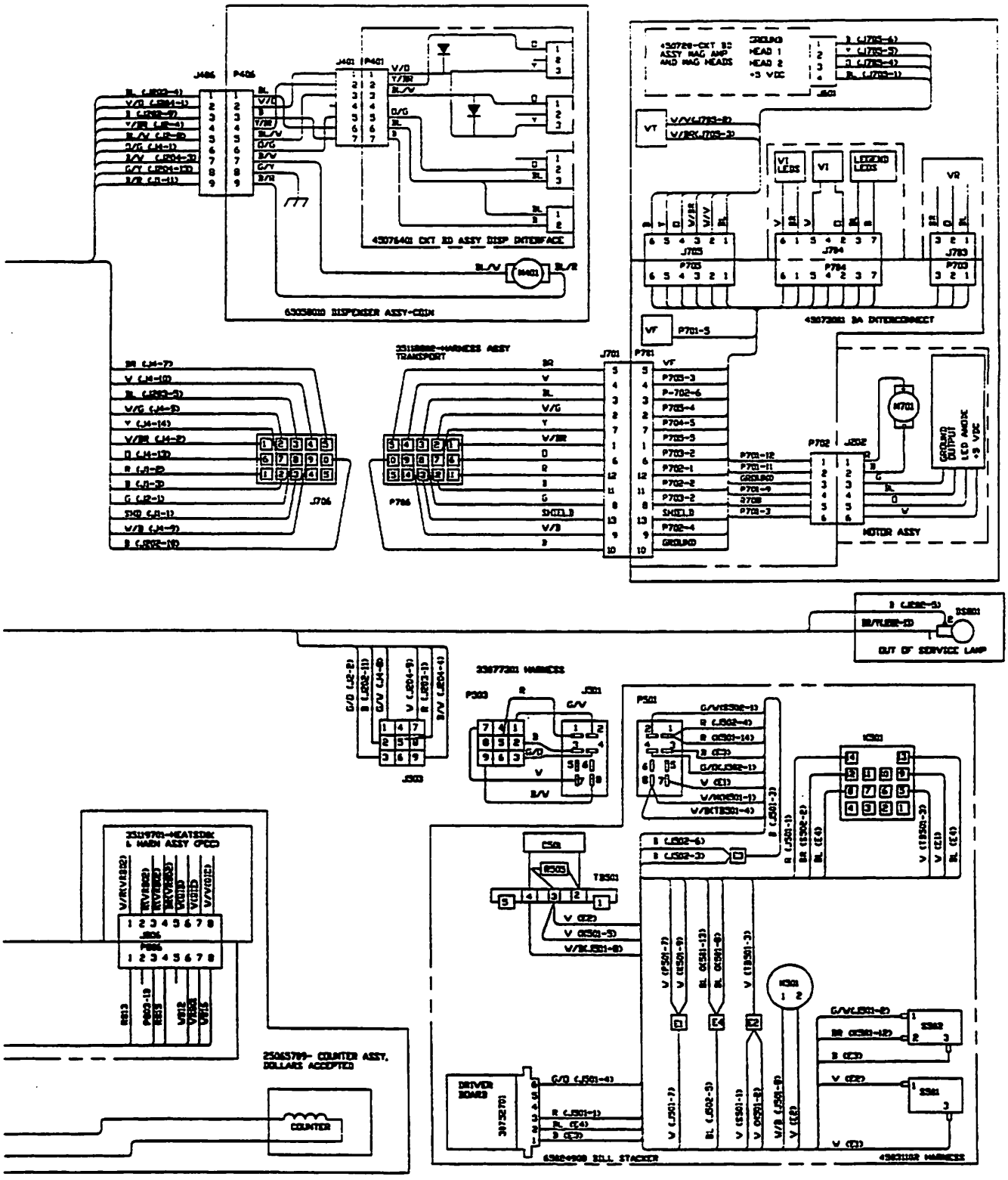
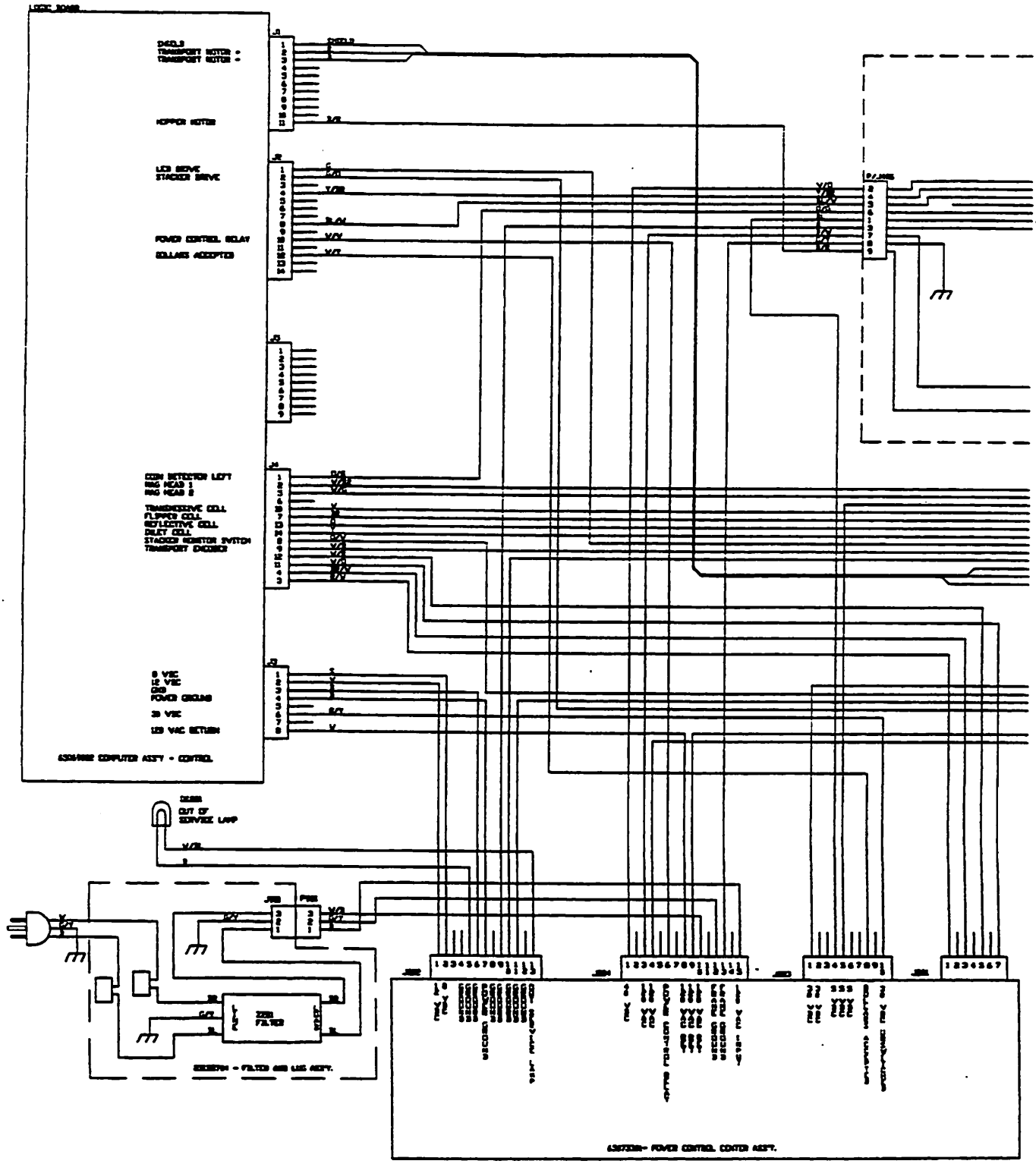
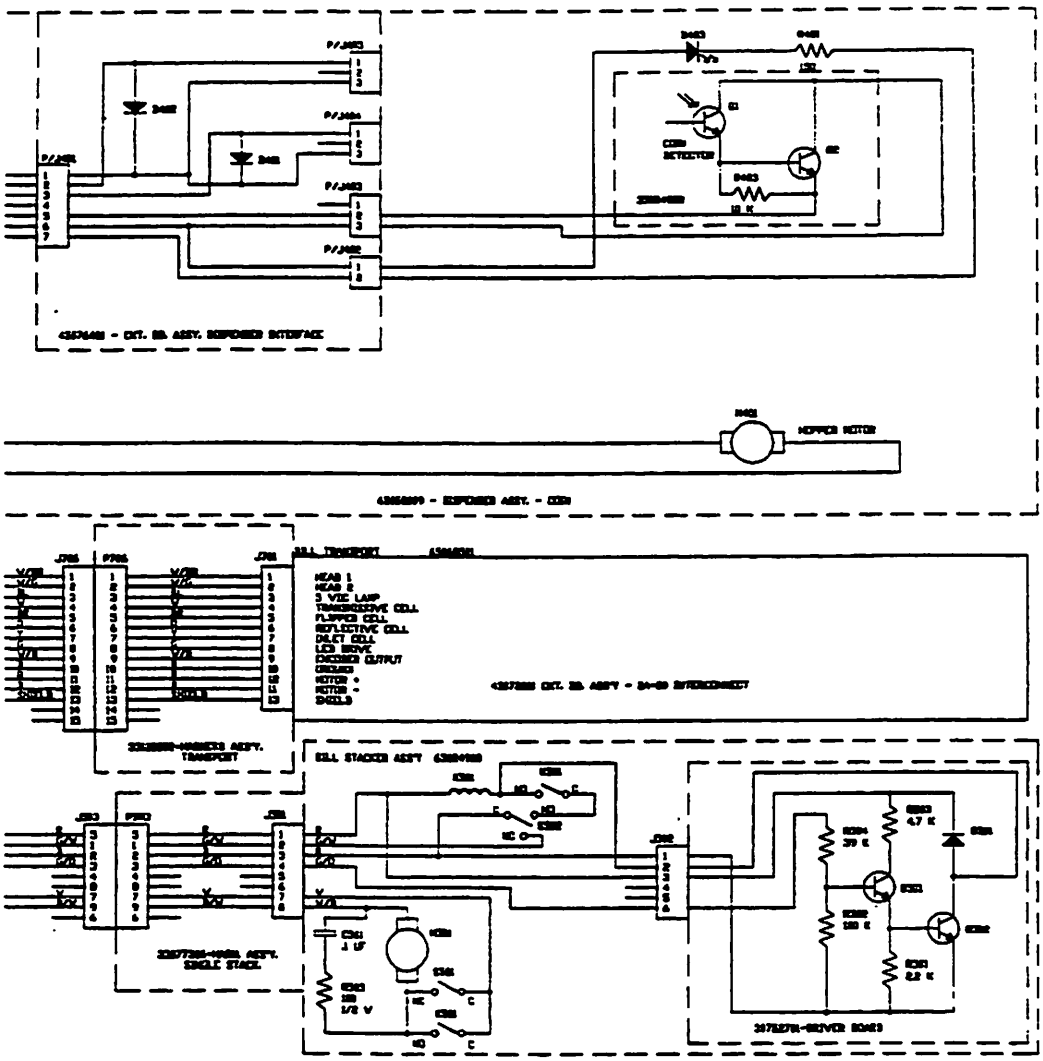

MOTOR
TRANSPORT MOTOR +
TRANSPORT MOTOR -
HOPPER MOTOR
LED DRIVE
STACKER DRIVE
NOT USED
NOT USED
POWER CONTROL RELAY
DOLLARS ACCEPTED
COIN DETECTOR
MAG HEAD 1
NOT USED
NOT USED
MAG HEAD 2
FLIPPER CELL
STACKER MONITOR SWITCH
TRANSPORT ENCODER
TRANSMISSIVE CELL
NOT USED
NOT USED
REFLECTIVE CELL
INLET CELL
5 VDC
12 VDC
GROUND
POWER GROUND
30 VDC
120 VAC RETURN
FILTER
LINE
LOAD
MAIN HARNESS
TB01
TEST SWITCHES
ON-OFF SWITCH
CIRCUIT BOARD ASSY
POWER CONTROL CENTER



For Equivalent Engineering Drawing See 25237902-01 A

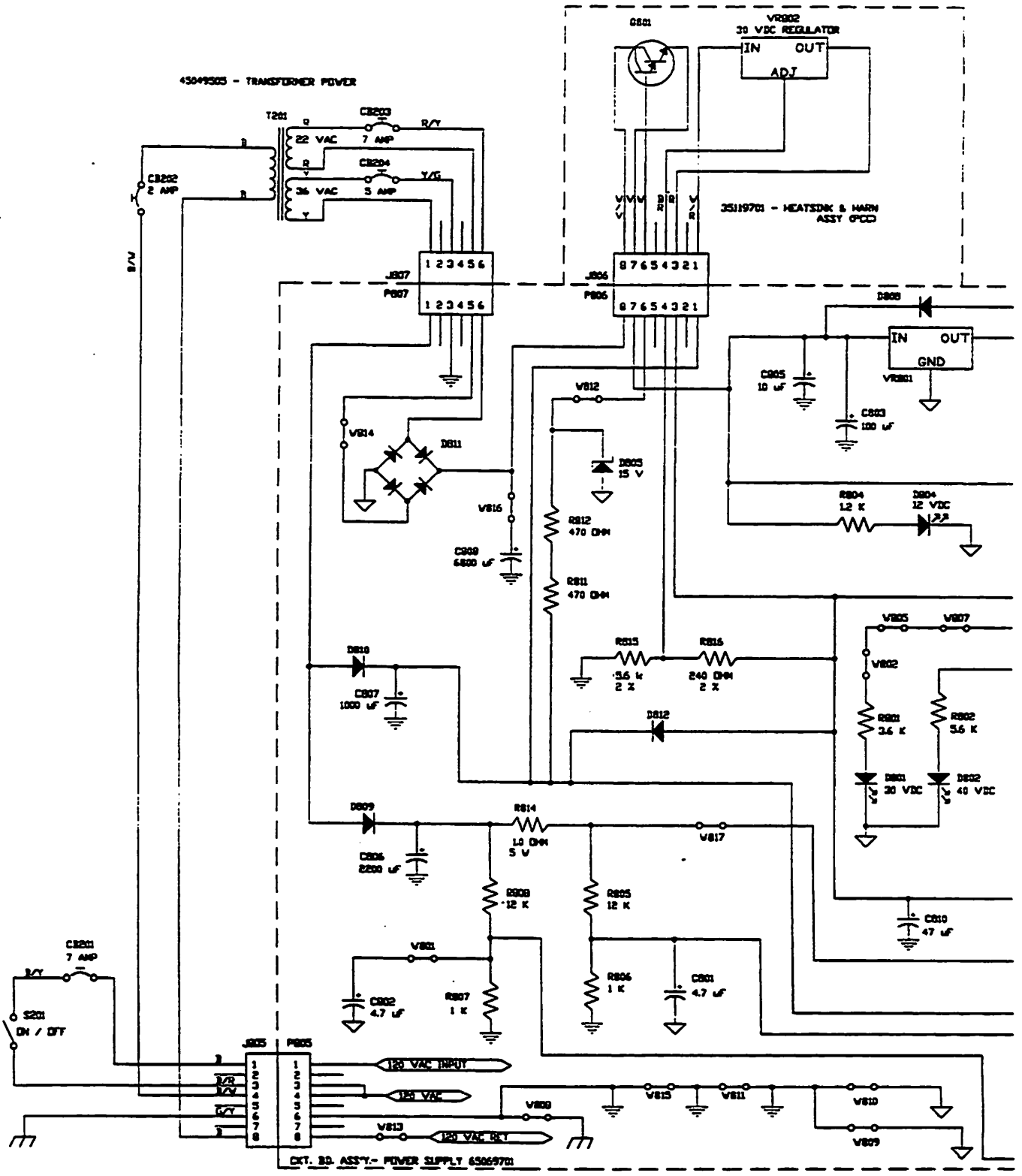
Figure 4-1. BC-150 Wiring Diagram

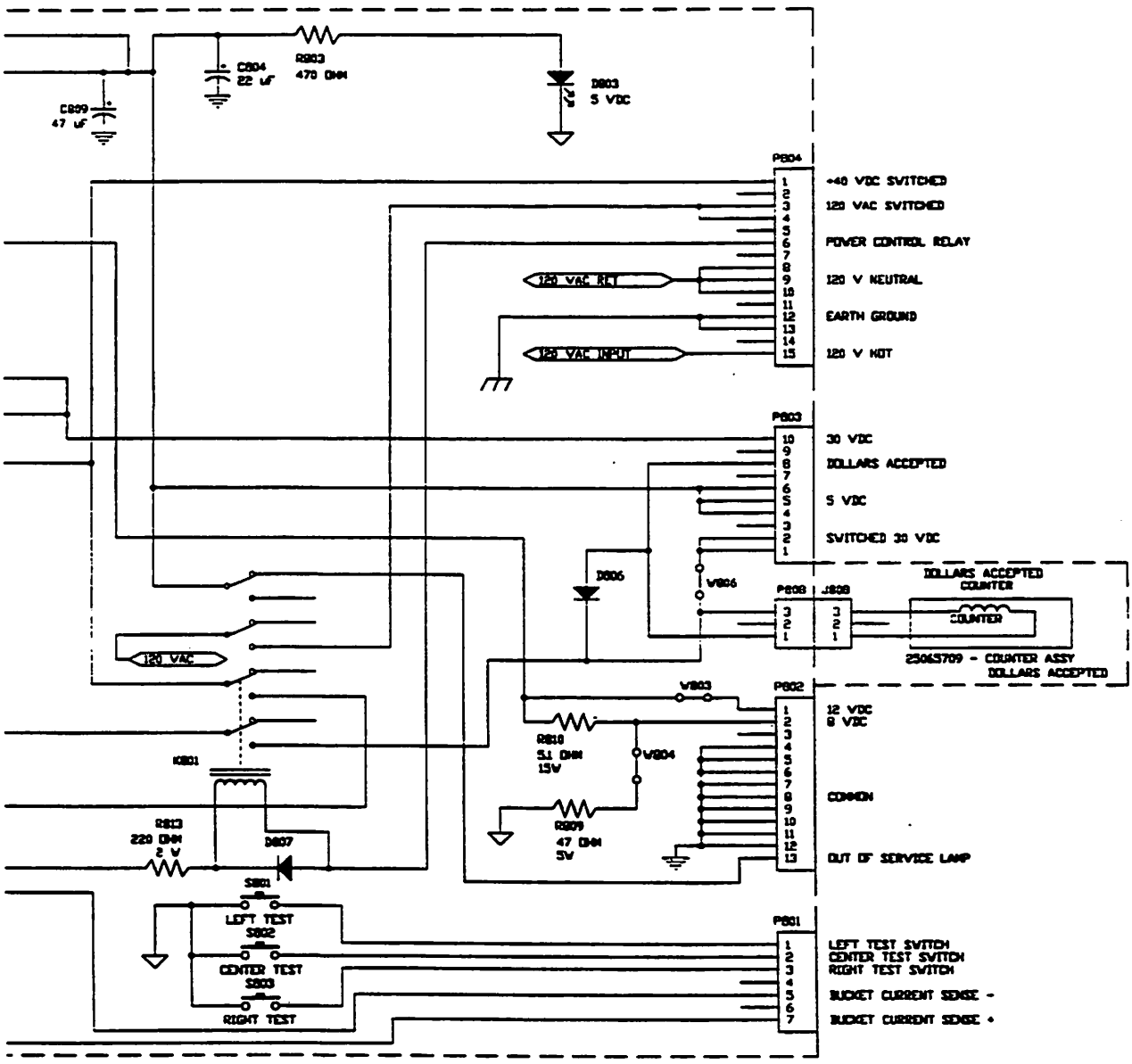




For Equivalent Engineering Drawing See 25237902-G2 A

Figure 4-2. BC-150 Schematic Diagram


45049505 - TRANSFORMER POWER
T201
CB203
7 AMP
22 VAC
CB204
5 AMP
36 VAC
CB202
2 AMP
J807
P807
J806
P806
1 2 3 4 5 6
8 7 6 5 4 3 2 1
Q801
VR802
30 VDC REGULATOR
IN
OUT
ADJ
35119701 - HEATSINK & HARN ASSY (PCB)
D808
VR801
GND
C805
10 uF
C803
100 uF
V812
V814
D811
D805
15 V
V816
R812
470 OHM
R811
470 OHM
C809
6800 uF
R804
1.2 K
D804
12 VDC
D810
C807
1000 uF
R815
3.6 K
2 X
R816
240 OHM
2 X
V805
V807
V802
R801
3.6 K
R802
5.6 K
D812
D801
30 VDC
D802
40 VDC
D809
R814
10 OHM
5 W
V817
C806
2200 uF
R808
12 K
R805
12 K
C810
47 uF
V801
C802
4.7 uF
R807
1 K
R806
1 K
C801
4.7 uF
CB201
7 AMP
S201
ON / OFF
J805
P805
120 VAC INPUT
120 VAC
120 VAC RET
V809
V813
V811
V810
V803
CKT. BD. ASSY.- POWER SUPPLY 45069701



For Equivalent Engineering Drawing See 65073501-G2 B

Figure 4-3. Schematic Diagram - Power Supply

Power Supply Circuit Board 65069701

C801	Capacitor - Tantalum	4.7 UF @ 35 VDC	70025116
C802	Capacitor - Tantalum	4.7 UF @ 35 VDC	70025116
C803	Capacitor - Electrolytic	100 UF @ 16 VDC	70023814
C804	Capacitor - Tantalum	22 UF @ 16 VDC	70025104
C805	Capacitor - Tantalum	10 UF @ 20 VDC	70025110
C806	Capacitor - Electrolytic	2200 UF @ 50 VDC	70023602
C807	Capacitor - Electrolytic	1000 UF @ 35 VDC	70023603
C808	Capacitor - Electrolytic	6800 UF @ 35 VDC	70023601
C809	Capacitor - Electrolytic	47 UF @ 35 VDC	70023812
C810	Capacitor - Electrolytic	47 UF @ 35 VDC	70023812

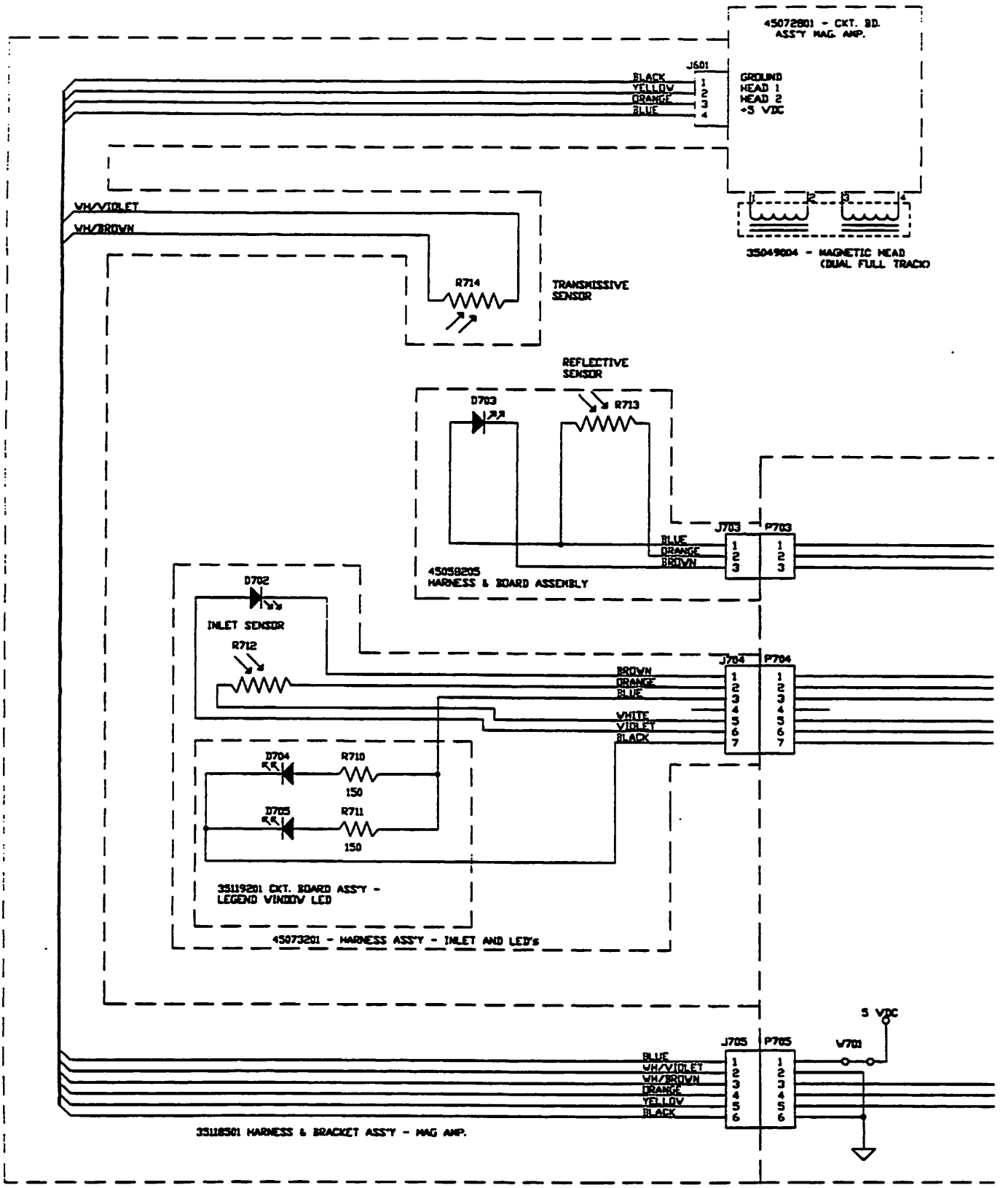
D801	Diode - Light Emitting	90°	70035201
D802	Diode - Light Emitting	90°	70035201
D803	Diode - Light Emitting	90°	70035201
D804	Diode - Light Emitting	90°	70035201
D805	Diode - Silicon	1N4744A 15 V 1 W	70035531
D806	Diode - Silicon	1N4004	70035005
D807	Diode - Silicon	1N4004	70035005
D808	Diode - Silicon	1N4004	70035005
D809	Diode - Silicon	MR752	70035010
D810	Diode - Silicon	1N5401	70035004
D811	Rectifier - Bridge	10 Amp	21822504
D812	Diode - Silicon	1N4004	70035005

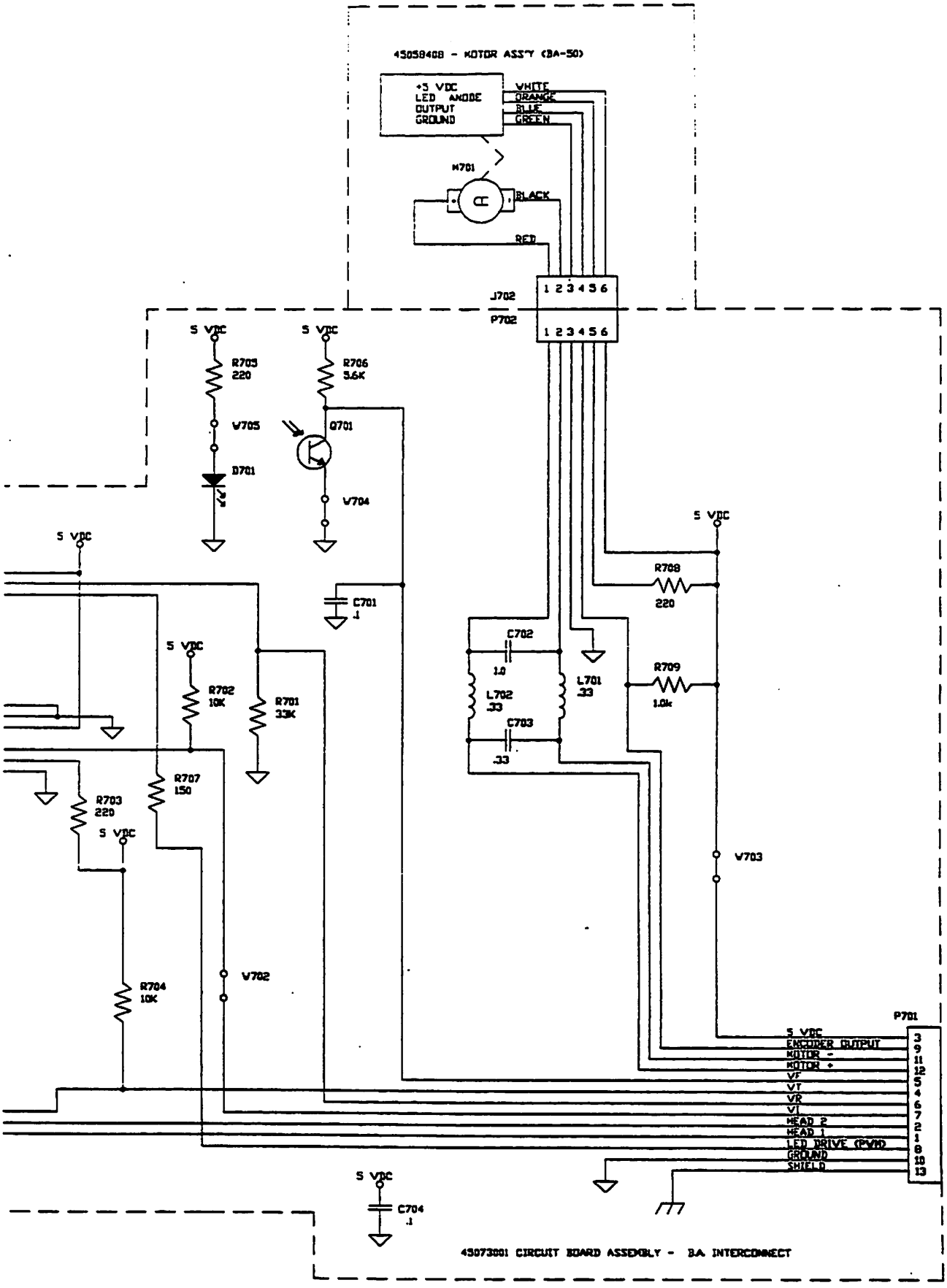
K801	(Relay Power) - 4PDT	35066802

P801	Header - Polarized	7 Position	70075007
P802	Header - Polarized	13 Position	70075013
P803	Header - Polarized	10 Position	70075010
P804	Header - Polarized	15 Position	70075015
P805	Header - Polarized	8 Position	70075008
P806	Header - Polarized	8 Position	70075008
P807	Header - Polarized	6 Position	70075006
P808	Header - Polarized	3 Position	70075003

Note: All resistors are ¼ watt 5%, unless otherwise noted.

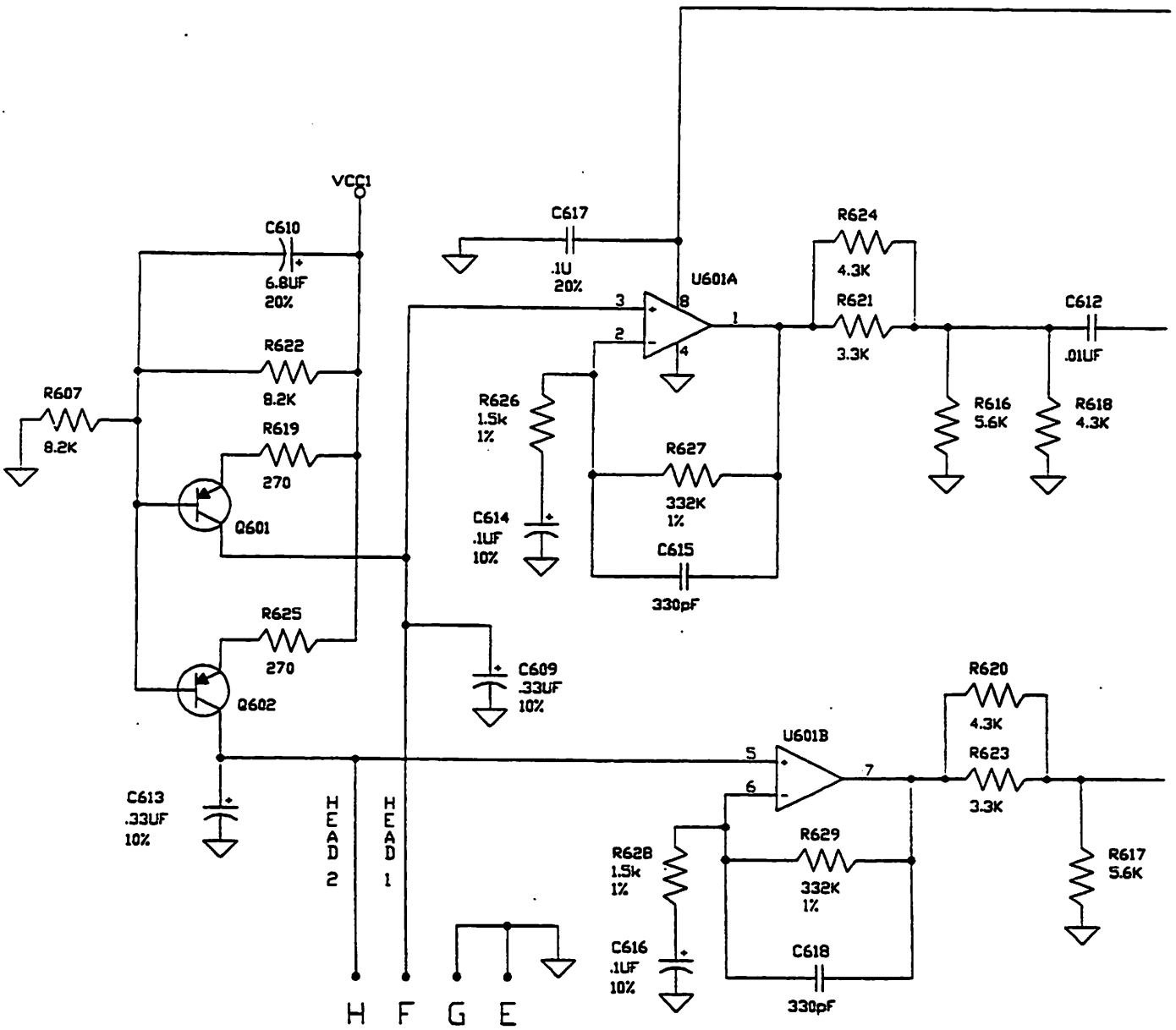
R801	Resistor - Carbon Film	3.6 K	79901362
R802	Resistor - Carbon Film	5.6 K	79901562
R803	Resistor - Carbon Film	470 Ω	79901471
R804	Resistor - Carbon Film	1.2 K	79901122
R805	Resistor - Carbon Film	12 K	79901123
R806	Resistor - Carbon Film	1 K	79901102
R807	Resistor - Carbon Film	1 K	79901102
R808	Resistor - Carbon Film	12 K	79901123
R809	Resistor - Wirewound	47 Ω (5 W, 10%)	70011012
R810	Resistor - Wirewound	5.1 Ω (15 W, 5%)	70012801
R811	Resistor - Wirewound	470 Ω (2 W, 10%)	79920471
R812	Resistor - Wirewound	470 Ω (2 W, 10%)	79920471
R813	Resistor - Wirewound	220 Ω (2 W, 5%)	79920221
R814	Resistor - Wirewound	1 Ω (5 W, 5%)	70011013
R815	Resistor - Carbon Film	5.6 K (¼ W, 2%)	79902562
R816	Resistor - Carbon Film	240 Ω (¼ W, 2%)	79902241
S801	Switch Push button - SPDT		21637902
S802	Switch Push button - SPDT		21637902
S803	Switch Push button - SPDT		21637902
VR801	I.C. - Voltage Regulator 5V	LM340K5	70036501

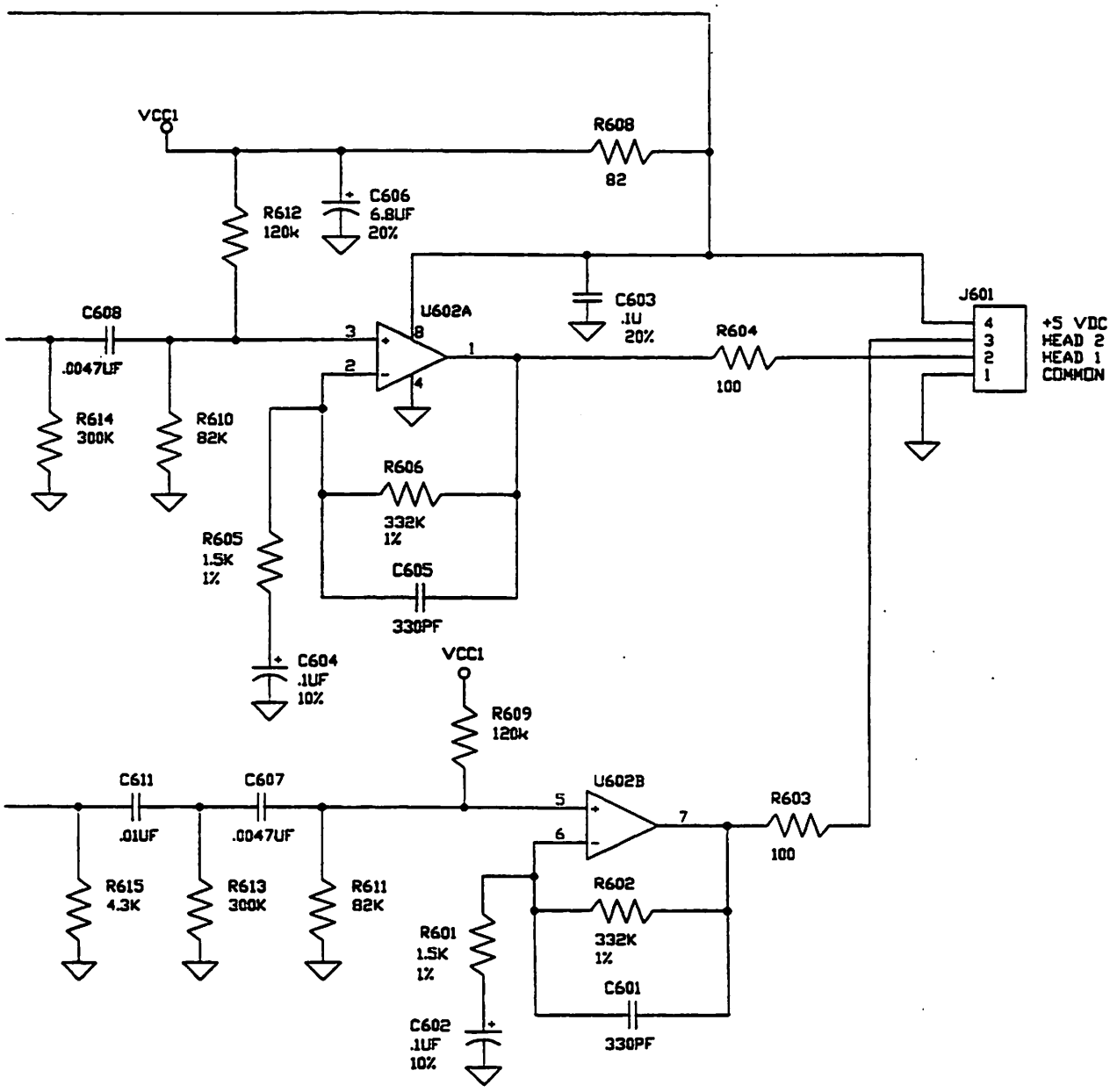

45072801 - CKT. BD. ASS'Y MAG. AMP.
J601
BLACK
YELLOW
ORANGE
BLUE
1
2
3
4
GROUND
HEAD 1
HEAD 2
+5 VDC
35049004 - MAGNETIC HEAD (DUAL FULL TRACK)
VH/VIOLET
VH/BROWN
R714
TRANSMISSIVE SENSOR
REFLECTIVE SENSOR
D703
R713
J703
P703
BLUE
ORANGE
BROWN
45058205 HARNESS & BOARD ASSEMBLY
D702
INLET SENSOR
R712
J704
P704
BROWN
ORANGE
BLUE
WHITE
VIOLET
BLACK
D704
R710
150
D705
R711
150
35119201 CKT. BOARD ASS'Y - LEGEND WINDOW LED
45073201 - HARNESS ASS'Y - INLET AND LED's
5 VDC
J705
P705
V701
BLUE
VH/VIOLET
VH/BROWN
ORANGE
YELLOW
BLACK
35118501 HARNESS & BRACKET ASS'Y - MAG AMP.



For Equivalent Engineering Drawing See 65068501-02 C

Figure 4-4. Schematic Diagram - BA-50 Transport


VCC1
C610
6.8UF
20%
R622
8.2K
R607
8.2K
R619
270
Q601
R625
270
Q602
C613
.33UF
10%
HEAD 2
HEAD 1
H F G E
C617
.1U
20%
U601A
3
2
8
1
4
R624
4.3K
R621
3.3K
C612
.01UF
R626
1.5k
1%
C614
.1UF
10%
R627
332K
1%
C615
330pF
R616
5.6K
R618
4.3K
C609
.33UF
10%
U601B
5
6
7
R620
4.3K
R623
3.3K
R628
1.5k
1%
C616
.1UF
10%
R629
332K
1%
C618
330pF
R617
5.6K



For Equivalent Engineering Drawing See 45072801-02 E

Figure 4-5. Schematic Diagram - Magnetic Amplifier Board

NOTE:

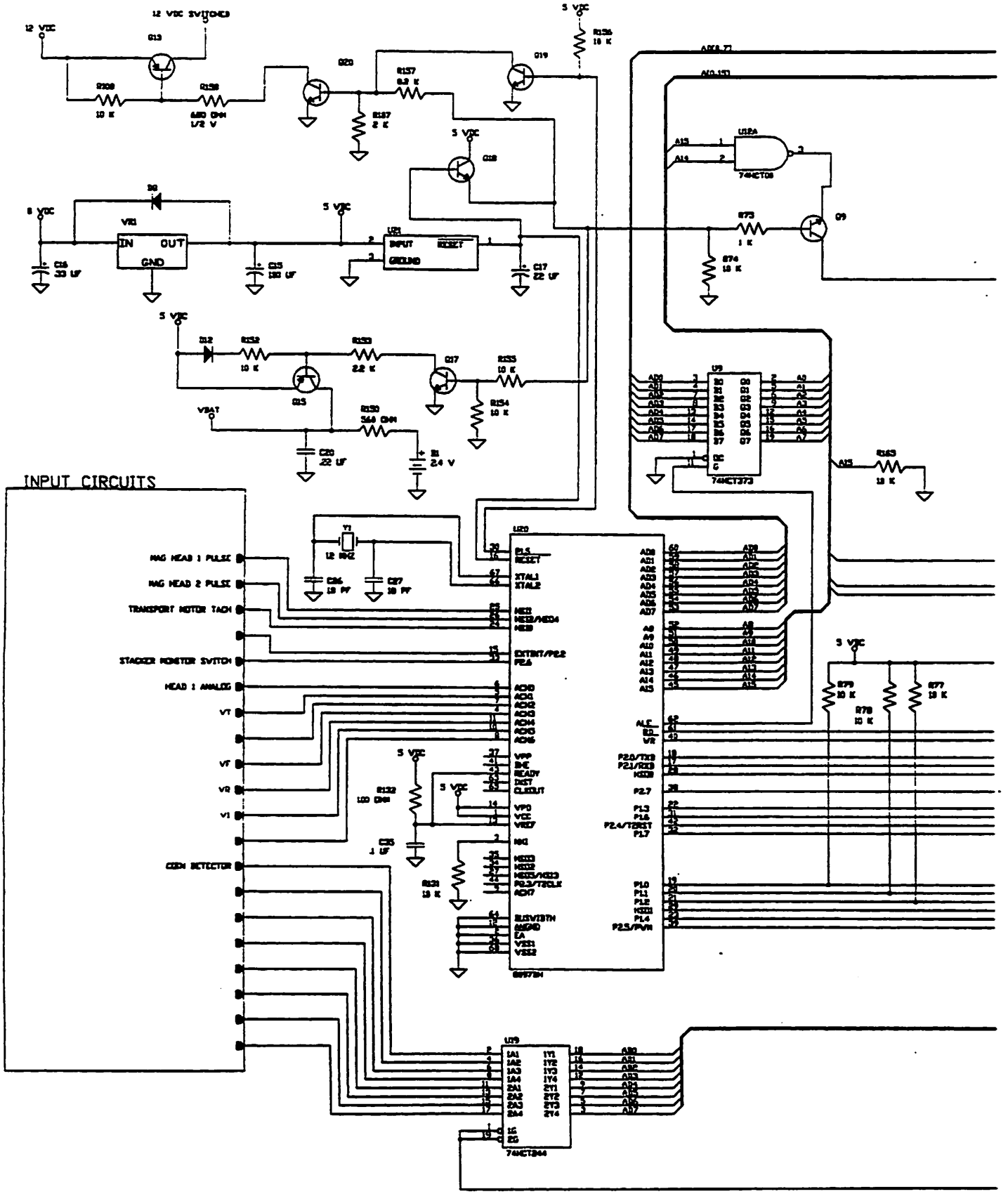
This components list is intended as a troubleshooting aid only. Rowe does not recommend replacement of any magnetic amplifier circuit board components. Replacing components on this circuit board may damage the magnetic head.

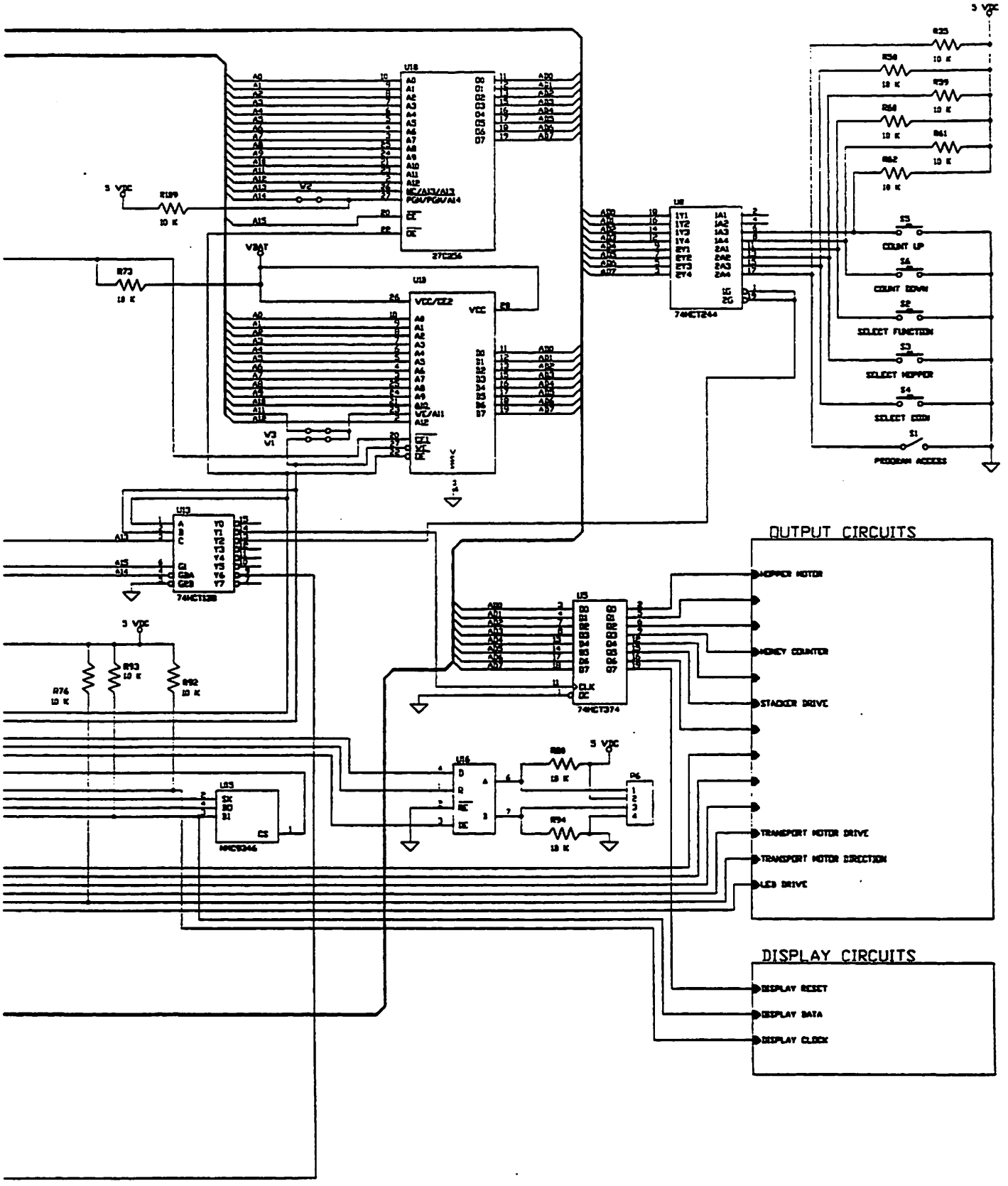
C601	Capacitor - Ceramic	330 PF @ 50 VDC, 5%	70028837
C602	Capacitor - Tantalum	.1 UF @ 16 VDC, 10%	70025201
C603	Capacitor - Ceramic	.1 UF @ 50 VDC, 5%	70028966
C604	Capacitor - Tantalum	.1 UF @ 16 VDC, 10%	70025201
C605	Capacitor - Ceramic	330 PF @ 50 VDC, 5%	70028837
C606	Capacitor - Tantalum	6.8 UF @ 16 VDC, 20%	70025203
C607	Capacitor - Ceramic	.0047 UF @ 50 VDC, 5%	70025203
C608	Capacitor - Ceramic	.0047 UF @ 50 VDC, 5%	70025203
C609	Capacitor - Tantalum	.33 UF @ 16 VDC, 10%	70025202
C610	Capacitor - Tantalum	6.8 UF @ 16 VDC, 20%	70025203
C611	Capacitor - Ceramic	.01 UF @ 50 VDC, 5%	70028941
C612	Capacitor - Ceramic	.01 UF @ 50 VDC, 5%	70028941
C613	Capacitor - Ceramic	.33 UF @ 16 VDC, 10%	70025202
C614	Capacitor - Tantalum	.1 UF @ 16 VDC, 10%	70025201
C615	Capacitor - Ceramic	330 PF @ 50 VDC, 5%	70028837
C616	Capacitor - Tantalum	.1 UF @ 16 VDC, 10%	70025201
C617	Capacitor - Ceramic	.1 UF @ 50 VDC, 5%	70028966
C618	Capacitor - Ceramic	330 PF @ 50 VDC, 5%	70028837
J601	Polarizing Wafer (90°)	4 Position	70074404
Q601	Transistor - PNP		70030106
Q602	Transistor - PNP		70030106

Note: All resistors are ⅛ watt 5%, unless otherwise noted.

R601	Resistor - Carbon	1.5 K Ω	(⅛ W, 1%)	799101501
R602	Resistor - Carbon	332 K Ω	(⅛ W, 1%)	799103323
R603	Resistor - Carbon	100 Ω		79911101
R604	Resistor - Carbon	100 Ω		79911101
R605	Resistor - Carbon	1.5 K Ω	(⅛ W, 1%)	799101501
R606	Resistor - Carbon	332 K Ω	(⅛ W, 1%)	799103323
R607	Resistor - Carbon	8.2 K Ω		79911822
R608	Resistor - Carbon	82 Ω		79911820
R609	Resistor - Carbon	120 K Ω		79911124
R610	Resistor - Carbon	82 K Ω		79911823
R611	Resistor - Carbon	82 K Ω		79911823
R612	Resistor - Carbon	120 K Ω		79911124
R613	Resistor - Carbon	300 K Ω		79911304
R614	Resistor - Carbon	300 K Ω		79911304
R615	NOT USED			
R616	Resistor - Carbon	5.6 K Ω		79911562
R617	Resistor - Carbon	5.6 K Ω		79911562
R618	Resistor - Carbon	4.3 K Ω		79911432
R619	Resistor - Carbon	270 Ω		79911271
R620	Resistor - Carbon	4.3 K Ω		79911432
R621	Resistor - Carbon	3.3 K Ω		79911332
R622	Resistor - Carbon	8.2 K Ω		79911822
R623	Resistor - Carbon	3.3 K Ω		79911332
R624	Resistor - Carbon	4.3 K Ω		79911432
R625	Resistor - Carbon	270 Ω		79911271
R626	Resistor - Carbon	1.5 K Ω	(⅛ W, 1%)	799101501
R627	Resistor - Carbon	332 K Ω	(⅛ W, 1%)	799103323
R628	Resistor - Carbon	1.5 K Ω	(⅛ W, 1%)	799101501
R629	Resistor - Carbon	332 K Ω	(⅛ W, 1%)	799103323

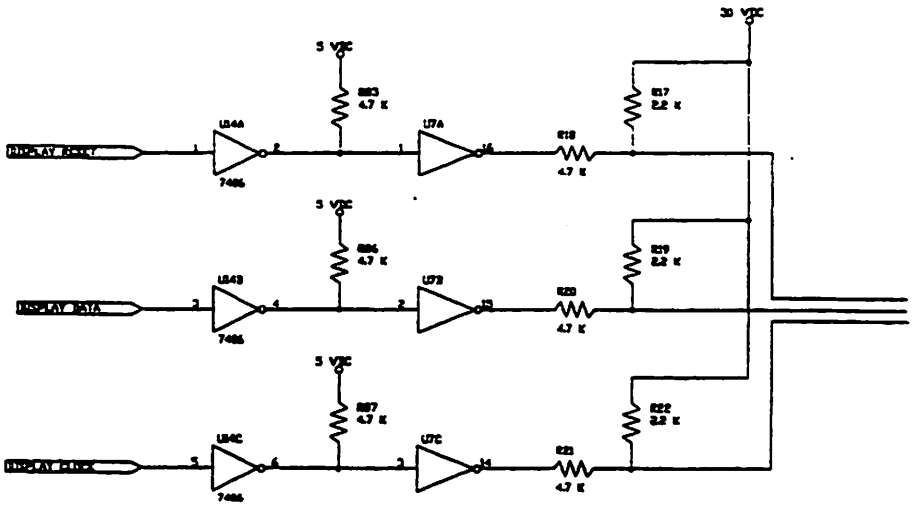
U601	I.C. - Dual OP. Amp. (LM358)	30800244
U602	I.C. - Dual OP. Amp. (LM358)	30800244


INPUT CIRCUITS
MAG HEAD 1 PULSE
MAG HEAD 2 PULSE
TRANSPORT MOTOR TACH
STACKER MONITOR SWITCH
HEAD 1 ANALOG
VT
VF
V2
V1
COIN DETECTOR
5 VDC
12 VDC
VBAT
74HCT373
74HCT244

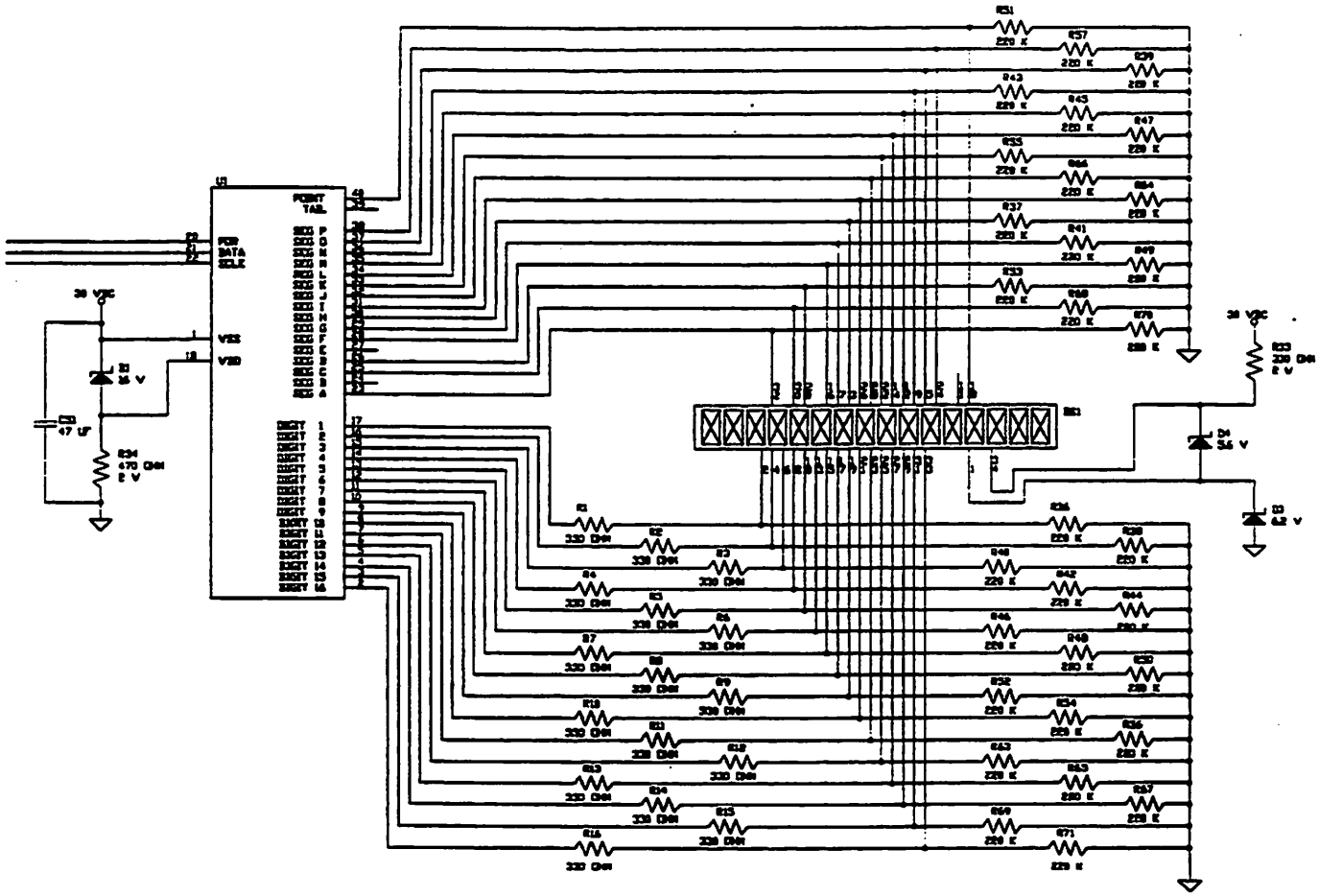


For Equivalent Engineering Drawing See 65068202-02 A, Sheet 1 of 4

Figure 4-6. Schematic Diagram - Changer Control Computer Board

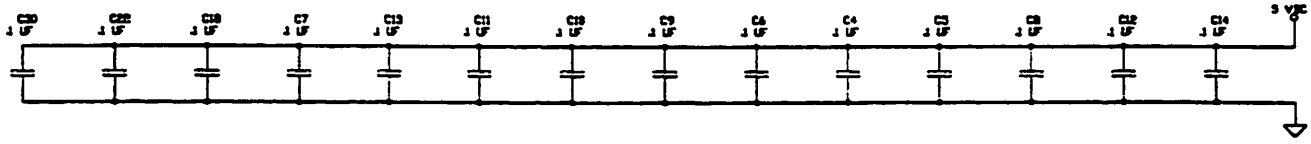


DEVICE	+5 VDC	GND	PGND
U5	20	10	
U6	14	7	
U7		8	
U8	20	10	
U9	20	10	
U11			8
U12	14	7	
U13	16	8	
U14	14	7	
U15	8	5	
U16	8	5	
U17	14	7	
U18	1,28	14	
U19	20	10	



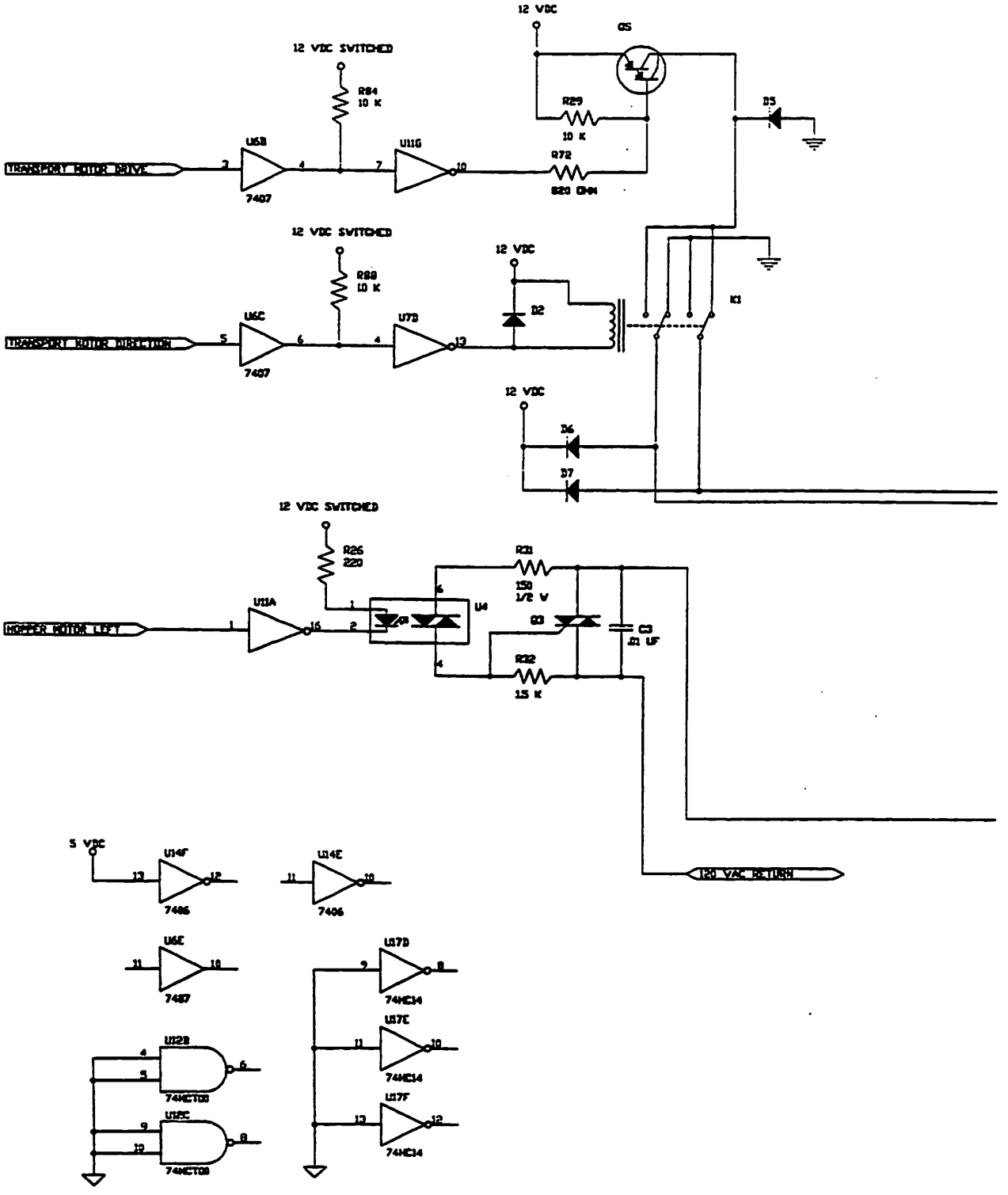
NOTE:

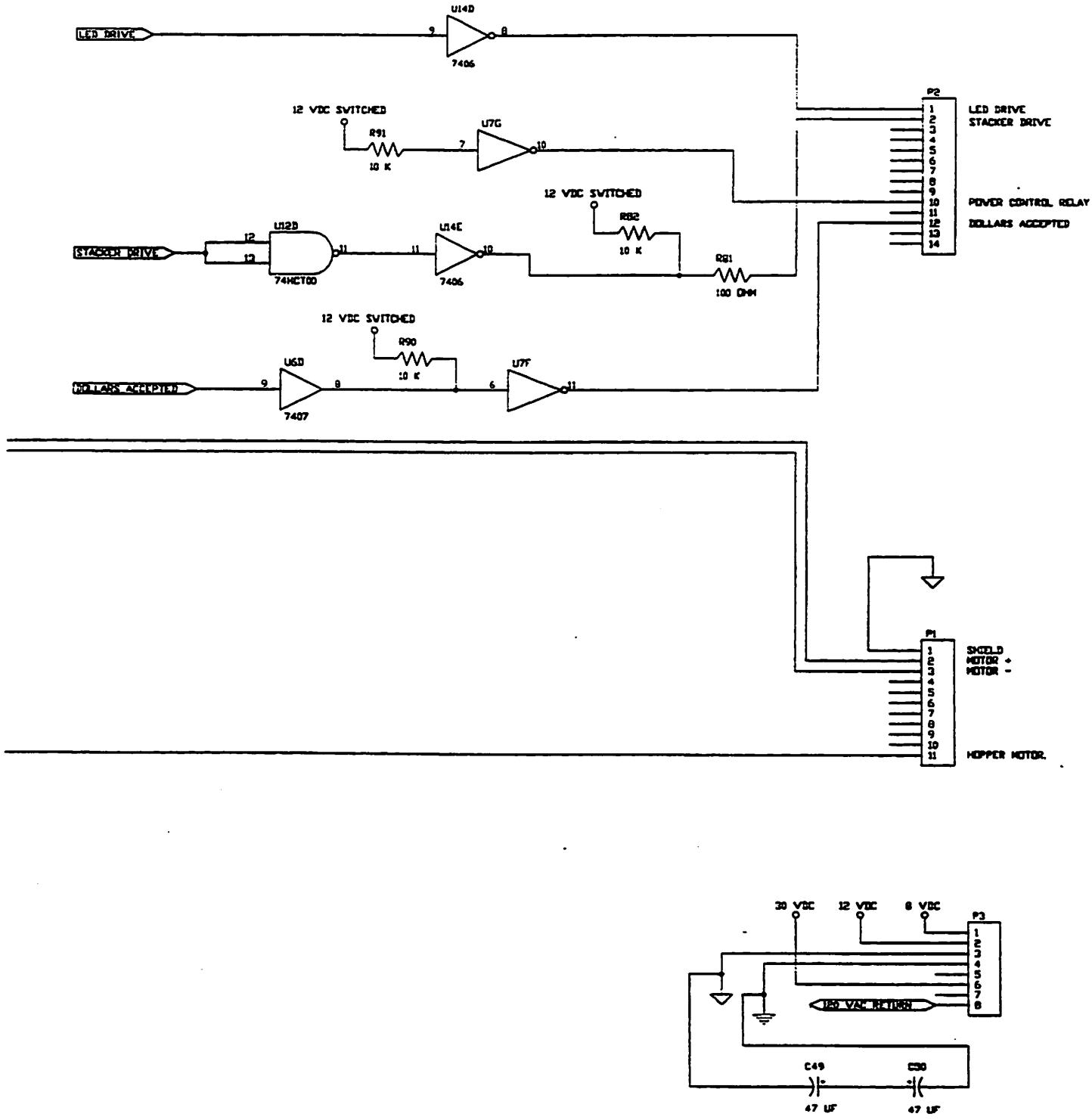
R1–R16, R36–R57, AND R63–R71
ARE 1/8 W



For Equivalent Engineering Drawing See 65068202-Q2 A, Sheet 2 of 4

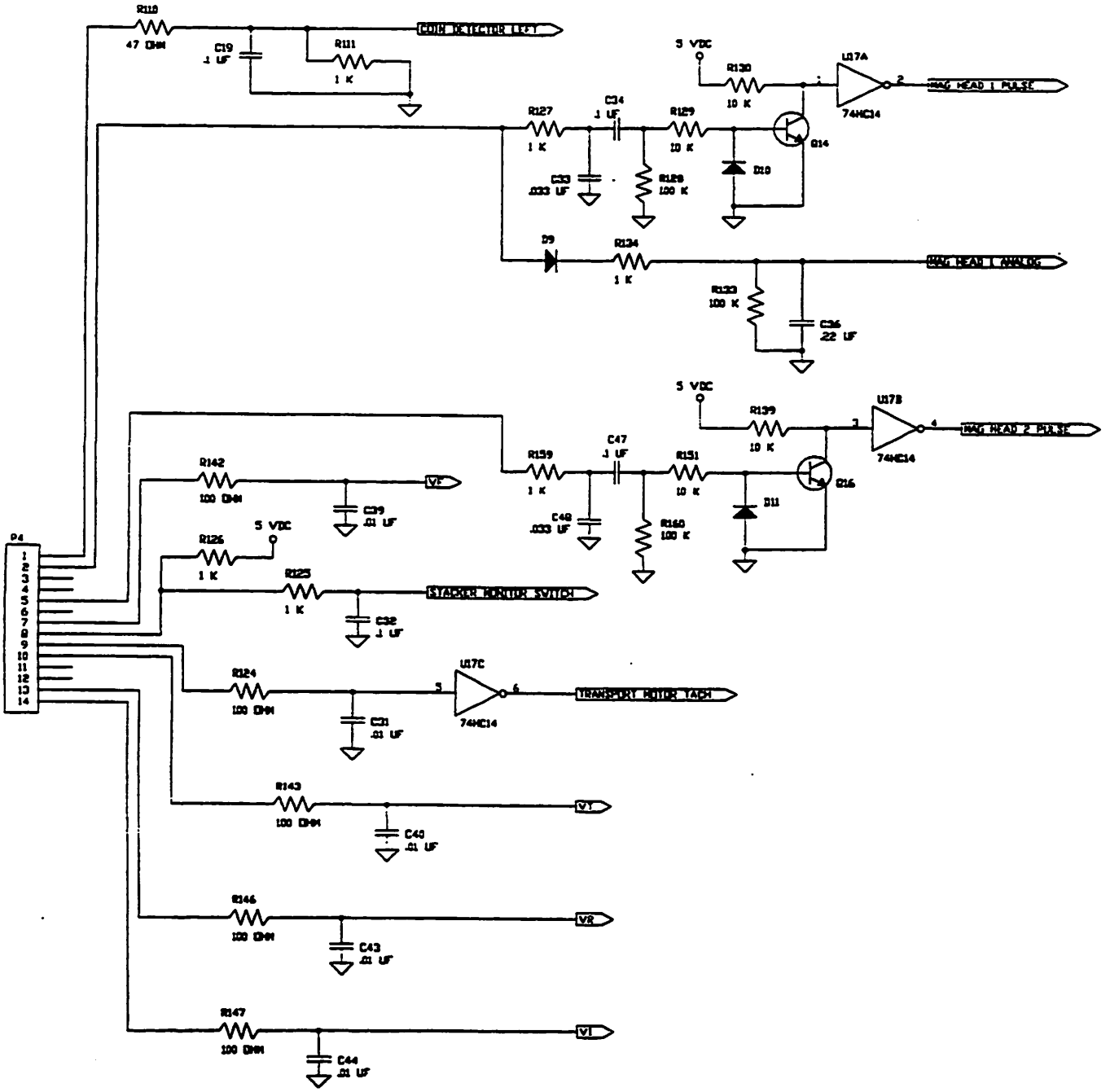
Figure 4-6. Schematic Diagram - Changer Control Computer Board


12 VDC
Q5
12 VDC SWITCHED
R84
10 K
R29
10 K
D5
U5B
U11G
TRANSPORT MOTOR DRIVE
7407
R72
12 VDC SWITCHED
R89
10 K
12 VDC
D2
K1
U6C
U7B
TRANSPORT MOTOR DIRECTION
7407
12 VDC
D6
D7
12 VDC SWITCHED
R26
220
R31
150
1/2 W
U11A
U4
HOPPER MOTOR LEFT
D3
C3
.01 UF
R32
15 K
120 VAC RETURN
5 VDC
U14F
7406
U14E
7406
U6E
7407
U17D
74HC14
U17E
74HC14
U17F
74HC14
U12B
74HCT08
U12C
74HCT08



For Equivalent Engineering Drawing See 65068202-02 A, Sheet 3 of 4

Figure 4-6. Schematic Diagram - Changer Control Computer Board



For Equivalent Engineering Drawing See 65068202-G2 A, Sheet 4 of 4

Figure 4-6. Schematic Diagram - Changer Control Computer Board

Bill Changer Control Computer Board 65068202

B1	Battery - Rechargeable			30763103
C1	NOT USED			
C2	NOT USED			
C3	Capacitor - Ceramic Disc	.01 UF	1 KV	70022508
C4	Capacitor - Monolithic Ceramic	.1 UF		70028511
C5	Capacitor - Monolithic Ceramic	.1 UF		70028511
C6	Capacitor - Monolithic Ceramic	.1 UF		70028511
C7	Capacitor - Monolithic Ceramic	.1 UF		70028511
C8	Capacitor - Monolithic Ceramic	.1 UF		70028511
C9	Capacitor - Monolithic Ceramic	.1 UF		70028511
C10	Capacitor - Monolithic Ceramic	.1 UF		70028511
C11	Capacitor - Monolithic Ceramic	.1 UF		70028511
C12	Capacitor - Monolithic Ceramic	.1 UF		70028511
C13	Capacitor - Monolithic Ceramic	.1 UF		70028511
C14	Capacitor - Monolithic Ceramic	.1 UF		70028511
C15	Capacitor - Electrolytic	100 UF	16 VDC	70023814
C16	Capacitor - Tantalum	.33 UF	35 VDC	70025119
C17	Capacitor - Electrolytic	22 UF	35 VDC	70023810
C18	Capacitor - Monolithic Ceramic	.1 UF		70028511
C19	Capacitor - Monolithic Ceramic	.1 UF		70028511
C20	Capacitor - Monolithic Ceramic	.22 UF		70028510
C21	NOT USED			
C22	Capacitor - Monolithic Ceramic	.1 UF		70028511
C23	NOT USED			
C24	NOT USED			
C25	NOT USED			
C26	Capacitor - Monolithic Ceramic	18 PF		70028704
C27	Capacitor - Monolithic Ceramic	18 PF		70028704
C28	NOT USED			
C29	NOT USED			
C30	Capacitor - Monolithic Ceramic	.1 UF		70028511
C31	Capacitor - Monolithic Ceramic	.01 UF		70028501
C32	Capacitor - Monolithic Ceramic	.1 UF		70028511
C33	Capacitor - Monolithic Ceramic	.033 UF		70028506
C34	Capacitor - Monolithic Ceramic	.1 UF		70028514
C35	Capacitor - Monolithic Ceramic	.1 UF		70028511
C36	Capacitor - Mylar	.22 UF	100 VDC	70021553
C37	NOT USED			
C38	NOT USED			
C39	Capacitor - Monolithic Ceramic	.01 UF		70028636
C40	Capacitor - Monolithic Ceramic	.01 UF		70028636
C41	NOT USED			
C42	NOT USED			
C43	Capacitor - Monolithic Ceramic	.01 UF		70028636
C44	Capacitor - Monolithic Ceramic	.01 UF		70028636
C45	NOT USED			
C46	NOT USED			
C47	Capacitor - Monolithic Ceramic	.1 UF		70028514
C48	Capacitor - Monolithic Ceramic	.033 UF		70028506
C49	Capacitor - Tantalum	47 UF	15 VDC	70025102
C50	Capacitor - Tantalum	47 UF	15 VDC	70025102
C51	Capacitor - Electrolytic	47 UF	35 VDC	70023812

Bill Changer Control Computer Board 65068202
Continued

D1	Diode - Zener 16V 1W 5%	1N4745A	70035503
D2	Diode - Silicon	1N4004	70035005
D3	Diode - Zener 6.2V 1W 5%	1N4735A	70035508
D4	Diode - Zener 5.6V 1W 5%	1N4734A	70035507
D5	Diode - Silicon	1N4004	70035005
D6	Diode - Silicon	1N4004	70035005
D7	Diode - Silicon	1N4004	70035005
D8	Diode - Silicon	1N4004	70035005
D9	Diode - Silicon	1N4148	70035012
D10	Diode - Silicon	1N4148	70035012
D11	Diode - Silicon	1N4148	70035012
D12	Diode - Silicon	1N4148	70035012
DS1	Display - Vacuum Fluorescent 16 Character		30933202
K1	Relay - DPDT		70042405
P1	Header - Polarized - Right Angle - 11 Position		70076011
P2	Header - Polarized - Right Angle - 14 Position		70076014
P3	Header - Polarized - Right Angle - 8 Position		70076008
P4	Header - Polarized - Right Angle - 14 Position		70076014
P5	NOT USED		
P6	Header - Polarized - Right Angle - 4 Position		70076004
Q1	NOT USED		
Q2	NOT USED		
Q3	Thyristor - Triac	T2500D	70038102
Q4	NOT USED		
Q5	Transistor - Silicon Darlington	TIP115	70030805
Q6	NOT USED		
Q7	NOT USED		
Q8	NOT USED		
Q9	Transistor - Switching NPN	2N4124	70031301
Q10	NOT USED		
Q11	NOT USED		
Q12	NOT USED		
Q13	Transistor - Silicon PNP	D41D8	70030105
Q14	Transistor - Silicon NPN	MPS6521	70030007
Q15	Transistor - Silicon PNP	MPSA56	70030104
Q16	Transistor - Silicon NPN	MPS6521	70030007
Q17	Transistor - Silicon NPN	MPS6521	70030007
Q18	Transistor - Silicon NPN	MPS6521	70030007
Q19	Transistor - Silicon NPN	MPS6521	70030007
Q20	Transistor - Silicon NPN	MPS6521	70030007

Note: All resistors are 1/8 watt 5%, unless otherwise noted.

R1	Resistor - Carbon Film	330 Ω		79905331
R2	Resistor - Carbon Film	330 Ω		79905331
R3	Resistor - Carbon Film	330 Ω		79905331
R4	Resistor - Carbon Film	330 Ω		79905331
R5	Resistor - Carbon Film	330 Ω		79905331
R6	Resistor - Carbon Film	330 Ω		79905331
R7	Resistor - Carbon Film	330 Ω		79905331
R8	Resistor - Carbon Film	330 Ω		79905331
R9	Resistor - Carbon Film	330 Ω		79905331
R10	Resistor - Carbon Film	330 Ω		79905331
R11	Resistor - Carbon Film	330 Ω		79905331
R12	Resistor - Carbon Film	330 Ω		79905331
R13	Resistor - Carbon Film	330 Ω		79905331
R14	Resistor - Carbon Film	330 Ω		79905331
R15	Resistor - Carbon Film	330 Ω		79905331
R16	Resistor - Carbon Film	330 Ω		79905331
R17	Resistor - Carbon Film	2.2 K	(¼ W, 5%)	79901222
R18	Resistor - Carbon Film	4.7 K	(¼ W, 5%)	79901472
R19	Resistor - Carbon Film	2.2 K	(¼ W, 5%)	79901222
R20	Resistor - Carbon Film	4.7 K	(¼ W, 5%)	79901472
R21	Resistor - Carbon Film	4.7 K	(¼ W, 5%)	79901472
R22	Resistor - Carbon Film	2.2 K	(¼ W, 5%)	79901222
R23	NOT USED			
R24	NOT USED			
R25	NOT USED			
R26	Resistor - Carbon Film	220 Ω	(¼ W, 5%)	79901221
R27	NOT USED			
R28	NOT USED			
R29	Resistor - Carbon Film	10 K	(¼ W, 5%)	79901103
R30	NOT USED			
R31	Resistor - Metal Film	150 Ω	(½ W, 5%)	79904151
R32	Resistor - Carbon Film	1.5 K	(¼ W, 5%)	79901152
R33	Resistor - Wirewound	330 Ω	(2 W, 10%)	79920331
R34	Resistor - Wirewound	470 Ω	(2 W, 10%)	79920471
R35	Resistor - Carbon Film	10 K	(¼ W, 5%)	79901103
R36	Resistor - Carbon Film	220 K		79905224
R37	Resistor - Carbon Film	220 K		79905224
R38	Resistor - Carbon Film	220 K		79905224
R39	Resistor - Carbon Film	220 K		79905224
R40	Resistor - Carbon Film	220 K		79905224
R41	Resistor - Carbon Film	220 K		79905224
R42	Resistor - Carbon Film	220 K		79905224
R43	Resistor - Carbon Film	220 K		79905224
R44	Resistor - Carbon Film	220 K		79905224
R45	Resistor - Carbon Film	220 K		79905224
R46	Resistor - Carbon Film	220 K		79905224
R47	Resistor - Carbon Film	220 K		79905224
R48	Resistor - Carbon Film	220 K		79905224
R49	Resistor - Carbon Film	220 K		79905224

Bill Changer Control Computer Board 65068202
Continued

R50	Resistor - Carbon Film	220 K		79905224
R51	Resistor - Carbon Film	220 K		79905224
R52	Resistor - Carbon Film	220 K		79905224
R53	Resistor - Carbon Film	220 K		79905224
R54	Resistor - Carbon Film	220 K		79905224
R55	Resistor - Carbon Film	220 K		79905224
R56	Resistor - Carbon Film	220 K		79905224
R57	Resistor - Carbon Film	220 K		79905224
R58	Resistor - Carbon Film	10 K	(¼ W, 5%)	79901103
R59	Resistor - Carbon Film	10 K	(¼ W, 5%)	79901103
R60	Resistor - Carbon Film	10 K	(¼ W, 5%)	79901103
R61	Resistor - Carbon Film	10 K	(¼ W, 5%)	79901103
R62	Resistor - Carbon Film	10 K	(¼ W, 5%)	79901103
R63	Resistor - Carbon Film	220 K		79905224
R64	Resistor - Carbon Film	220 K		79905224
R65	Resistor - Carbon Film	220 K		79905224
R66	Resistor - Carbon Film	220 K		79905224
R67	Resistor - Carbon Film	220 K		79905224
R68	Resistor - Carbon Film	220 K		79905224
R69	Resistor - Carbon Film	220 K		79905224
R70	Resistor - Carbon Film	220 K		79905224
R71	Resistor - Carbon Film	220 K		79905224
R72	Resistor - Carbon Film	820 Ω	(½ W, 5%)	79901821

Note: All resistors are ¼ watt 5%, unless otherwise noted.

R73	Resistor - Carbon Film	10 K		79901103
R74	Resistor - Carbon Film	10 K		79901103
R75	Resistor - Carbon Film	1 K		79901102
R76	Resistor - Carbon Film	10 K		79901103
R77	Resistor - Carbon Film	10 K		79901103
R78	Resistor - Carbon Film	10 K		79901103
R79	Resistor - Carbon Film	10 K		79901103
R80	Resistor - Carbon Film	10 K		79901103
R81	Resistor - Carbon Film	100 Ω		79901101
R82	Resistor - Carbon Film	10 K		79901103
R83	NOT USED			
R84	Resistor - Carbon Film	10 K		79901103
R85	Resistor - Carbon Film	4.7 K		79901472
R86	Resistor - Carbon Film	4.7 K		79901472
R87	Resistor - Carbon Film	4.7 K		79901472
R88	Resistor - Carbon Film	10 K		79901103
R89	Resistor - Carbon Film	10 K		79901103
R90	Resistor - Carbon Film	10 K		79901103
R91	Resistor - Carbon Film	10 K		79901103
R92	Resistor - Carbon Film	10 K		79901103
R93	Resistor - Carbon Film	10 K		79901103
R94	Resistor - Carbon Film	10 K		79901103
R95	NOT USED			
R96	NOT USED			
R97	NOT USED			
R98	NOT USED			

Note: All resistors are 1/4 watt 5%, unless otherwise noted.

R99	NOT USED		
R100	NOT USED		
R101	NOT USED		
R102	NOT USED		
R103	NOT USED		
R104	NOT USED		
R105	NOT USED		
R106	NOT USED		
R107	Resistor - Carbon Film	2 K	79901202
R108	Resistor - Carbon Film	10 K	79901103
R109	Resistor - Carbon Film	10 K	79901103
R110	Resistor - Carbon Film	47 Ω	79901470
R111	Resistor - Carbon Film	1 K	79901102
R112	NOT USED		
R113	NOT USED		
R114	NOT USED		
R115	NOT USED		
R116	NOT USED		
R117	NOT USED		
R118	NOT USED		
R119	NOT USED		
R120	Resistor - Carbon Film	4.7 K	79901472
R121	NOT USED		
R122	NOT USED		
R123	NOT USED		
R124	Resistor - Carbon Film	100 Ω	79901101
R125	Resistor - Carbon Film	1 K	79901102
R126	Resistor - Carbon Film	1 K	79901102
R127	Resistor - Carbon Film	1 K	79901102
R128	Resistor - Carbon Film	100 K	79901104
R129	Resistor - Carbon Film	10 K	79901103
R130	Resistor - Carbon Film	10 K	79901103
R131	Resistor - Carbon Film	10 K	79901103
R132	Resistor - Carbon Film	100 Ω	79901101
R133	Resistor - Carbon Film	100 K	79901104
R134	Resistor - Carbon Film	1 K	79901102
R135	NOT USED		
R136	NOT USED		
R137	NOT USED		
R138	NOT USED		
R139	Resistor - Carbon Film	10 K	79901103
R140	NOT USED		
R141	NOT USED		
R142	Resistor - Carbon Film	100 Ω	79901101
R143	Resistor - Carbon Film	100 Ω	79901101
R144	NOT USED		
R145	NOT USED		
R146	Resistor - Carbon Film	100 Ω	79901101

Bill Changer Control Computer Board 65068202

Continued

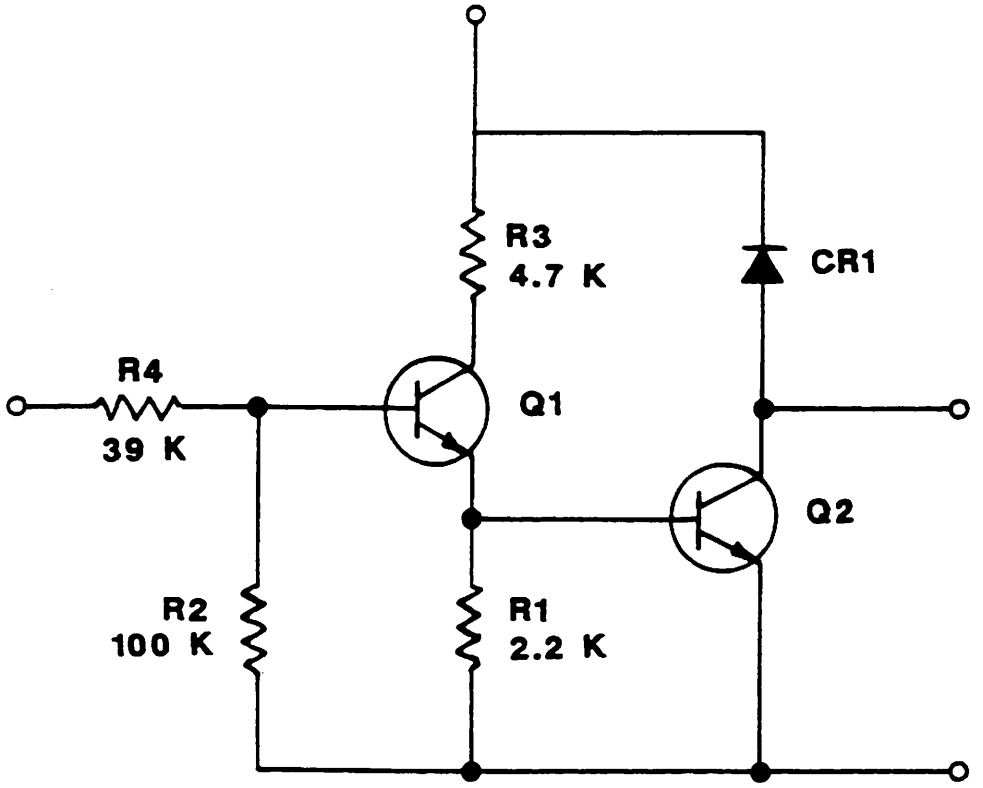
R147	Resistor - Carbon Film	100 Ω		79901101
R148	NOT USED			
R149	NOT USED			
R150	Resistor - Carbon Film	560 Ω		79901561
R151	Resistor - Carbon Film	10 K		79901103
R152	Resistor - Carbon Film	10 K		79901103
R153	Resistor - Carbon Film	2.2 K		79901222
R154	Resistor - Carbon Film	10 K		79901103
R155	Resistor - Carbon Film	10 K		79901103
R156	Resistor - Carbon Film	10 K		79901103
R157	Resistor - Carbon Film	8.2 K		79901822
R158	Resistor - Metal Film	680 Ω	(½ W, 5%)	79904681
R159	Resistor - Carbon Film	1 K		79901102
R160	Resistor - Carbon Film	100 K		79901104
R161	Resistor - Carbon Film	47 K		79901473

S1	Switch - Slide - Micro Miniature		70045001
S2	Switch - Push Button		21773303
S3	Switch - Push Button		21773303
S4	Switch - Push Button		21773303
S5	Switch - Push Button		21773303
S6	Switch - Push Button		21773303

U1	I.C. - Display Driver	10955P-50	30800227
U2	NOT USED		
U3	NOT USED		
U4	Photocoupler - Opto - Triac	3010	033703
U5	I.C. - Octal D Latch	74HCT374	930374
U6	I.C. - TTL Hex. Buffer O.C.	7407	036309
U7	I.C. - Darlington Array	ULN2003	036901
U8	I.C. - Octal Buffer	74HCT244	930244
U9	I.C. - Octal Transparent Latch	74HCT373	930373
U10	I.C. - 8K X 8 CMOS RAM		036604
U11	I.C. - Darlington Array	ULN2003	036901
U12	I.C. - Quad 2 Input NAND Gate	74HCT00	930000
U13	I.C. - 1-Of-8 Decoder	74HCT138	930138
U14	I.C. - TTL Hex Invertor O.C.	7406	036311
U15	I.C. - EPROM 64X16 Serial	NMC9346N	800245
U16	I.C. - Transceiver RS-485	75176	037801
U17	I.C. - Hex Schmitt Trigger Invertor	74HC14	940014
U18	I.C. - 32K X 8 Programmed EPROM BC-150	V1.0	800311
U19	I.C. - Octal Buffer	74HCT244	930244
U20	I.C. - Microcomputer	8097	037142
U21	I.C. - Under Voltage Sensing Circuit		800243

VR1	I.C. - Voltage Regulator 5V	LM340T5	036505

Y1	Crystal - Quartz 12.0 MHZ		167319



For Equivalent Engineering Drawing See 30752701 K

Figure 4-7. Driver Circuit Board Schematic

Bill Stacker Driver Circuit Board 30752701

CR1	Diode - Silicon		70035005
Q1	Transistor - Silicon (NPN)		70030004
Q2	Transistor - Silicon (NPN)		70030004

Note: All resistors are ¼ watt 5%, unless otherwise noted.

R1	Resistor - Carbon	2.2 K	79901222
R2	Resistor - Carbon	100 K	79901104
R3	Resistor - Carbon	4.7 K	79901472
R4	Resistor - Carbon	39 K	79901393

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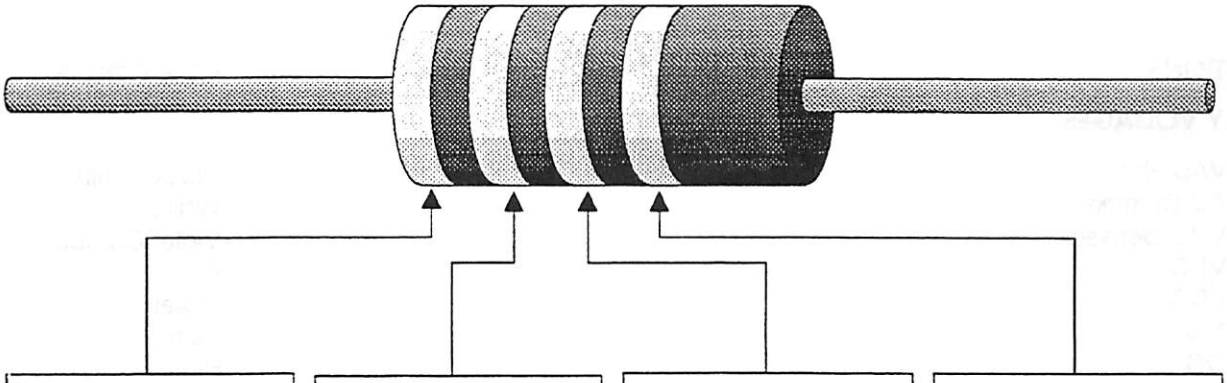
Section 5: Additional Information



First Band 1st Digit	
Color	Digit
Black	0
Brown	1
Red	2
Orange	3
Yellow	4
Green	5
Blue	6
Violet	7
Gray	8
White	9

Second Band 2nd Digit	
Color	Digit
Black	0
Brown	1
Red	2
Orange	3
Yellow	4
Green	5
Blue	6
Violet	7
Gray	8
White	9

Third Band Multiplier	
Color	Multiplier
Black	1
Brown	10
Red	100
Orange	1,000
Yellow	10,000
Green	100,000
Blue	1,000,000
Silver	0.01
Gold	0.1

Fourth Band Resistance Tolerance	
Color	Tolerance
Silver	±10%
Gold	± 5%
No Band	±20%

Figure 5-1. Resistor Color Code

Example: You have a resistor with the colors Yellow, Violet, Red, and Gold on it. Place the resistor in front of you so that the end of the resistor with no colored bands is on your right. Now, use the color code chart to decode the colors: the Yellow band=4, the Violet band=7, the Red band means multiply by 100. So the resistor value is 47X100, or 4700 ohms. The Gold band indicates that the resistor can be 5% over or 5% under the 4700 value and still be considered to be the proper value.

NOTE:

Testing a resistor while both ends of the resistor are connected to the circuit can give a false LOW reading. If the resistor value is critical, disconnect one end of the resistor from the circuit and use an accurate digital VOM.

HARNESS COLOR CODING

Harness wiring in the BC-150 is color coded according to function. To check wiring in the machine, find the function you want in the chart below and note the wire color associated with this function. Then, check this color wiring to find the source of problem. The wiring diagram will tell you where the wires are routed.

FUNCTIONS	WIRE COLOR
SUPPLY VOLTAGES[1]	
120 VAC Hot	Black/ White
120 AC Common	White
+40 VDC Sensed	Violet/Orange
+30 VDC	Red
+12 VDC	Violet
+8 VDC	Slate
+5 VDC	Blue
GROUNDS	
Earth (Fault) Ground	Green/Yellow
High Current Ground	Black
Low Voltage Common	Black
SIGNAL LINES	
Transport:	
Magnetic Head	White/Brown and White/Green
VF Cell	Brown
VI Cell	Yellow
VT Cell	White
VR Cell	Orange
Transport Motor	Shielded Cable
Bill Stacker:	
Stacker Drive Signal	Green/Orange
Stacker Monitor	Green/White

FUNCTIONS		WIRE COLOR
Dispenser:		
Coin Detector		Orange/Green
Hopper Motor		Black/Red
Left Vend Solenoid	Wires present in main harness, but are not used in the BC-150	Yellow/Brown
Right Vend Solenoid		Blue/White
Out of Service Lamp:		White/Blue

[1] Inside the power control center, as voltage lines pass through the circuit breakers, wire colors change for clarity. See the power control center power supply schematic for these wire colors.

Section 6: Parts Catalog

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BC-150 ORDER OPTIONS SHEET	6-2
INTRODUCTION	6-3
Catalog Description	6-3
Parts List Description	6-3
Ordering Replacement Parts	6-3
PARTS CATALOG	
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Door Assembly	6-7
BA-50 Bill Acceptor Assembly	6-10
Power Control Center Assembly	6-13
Changer Control Computer Assembly	6-15
Coin Dispenser Assembly	6-17
Change Bucket Assembly	6-19
Hi-Capacity Hopper Assembly	6-23
Bill Stacker Assembly	6-25
ACCESSORY KITS	6-26

DIGIT 1 = MODEL IDENTIFICATION

5 = Bill Changer

DIGIT 2 = CABINET ASSEMBLIES

1 = Charcoal Brown
2 = IBM Black
3 = White
4 = Blue/White
5 = IBM Black ($1,$5,$10,$20) = 2-52384-05

DIGIT 3 = HOPPER COMBINATIONS

1 = One Hi-Cap 5/10/25 = 6-50276-08
2 = One Hi-Cap Token/$ Coin/25 = 6-50276-09

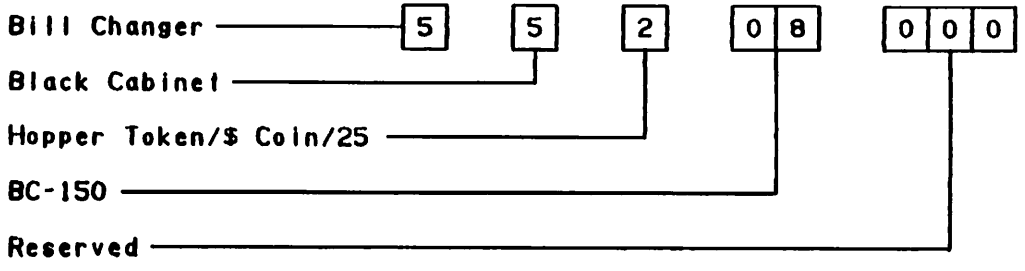
DIGIT 4 & 5 = COMMON PARTS GROUP

08 = BC-150 = 2-52379-02

DIGIT 6,7 & 8 = RESERVED

000

EXAMPLE:



INTRODUCTION

This parts catalog lists procurable replacement parts for the BC-150. The purpose of this parts catalog is to locate and identify replaceable components and supply information on how to order them.

Catalog Description

This catalog is divided into major sections labeled figures, which correspond to the illustrations used. Some assemblies require more than one illustration to identify the parts. Each page has a sheet number to identify the sheet as part of that assembly's parts list.

Since replacing parts that are welded or riveted onto an assembly is normally impractical, replacement parts are not listed for these items. The assembly that contains the welded part should be replaced.

Parts List Description

The parts list contains four columns:

- **Figure, Sheet, and Index Number** — The first entry in this column is the figure number of the corresponding illustration. An index number, when listed, corresponds to the index number appearing on the illustration. Index numbers are not used when items are listed for reference purposes only or when the item listed is an alternate part.

- **Rowe Part Number** — This column lists the part number to use when ordering replacement parts or making inquiries.

- **Description** — This column gives a word description of each part or assembly. Each item is indented to show its relationship to the next higher assembly.

- **Qty** — This column contains the part quantity used in the assembly. When a figure describes more than one model of an assembly, the "Qty" column is divided to show each model.

Ordering Replacement Parts

All replacement parts must be ordered directly from an authorized Rowe Distributor.

Once the replacement item has been determined, complete a Standard Parts Order Form, which is available from your Rowe Distributor at no charge. Very often parts orders are delayed because of inadequate or incompletely filled out parts order forms. To enable prompt delivery, always specify the following information:

- Part Number and Description (indicate color, if applicable)

- Quantity required

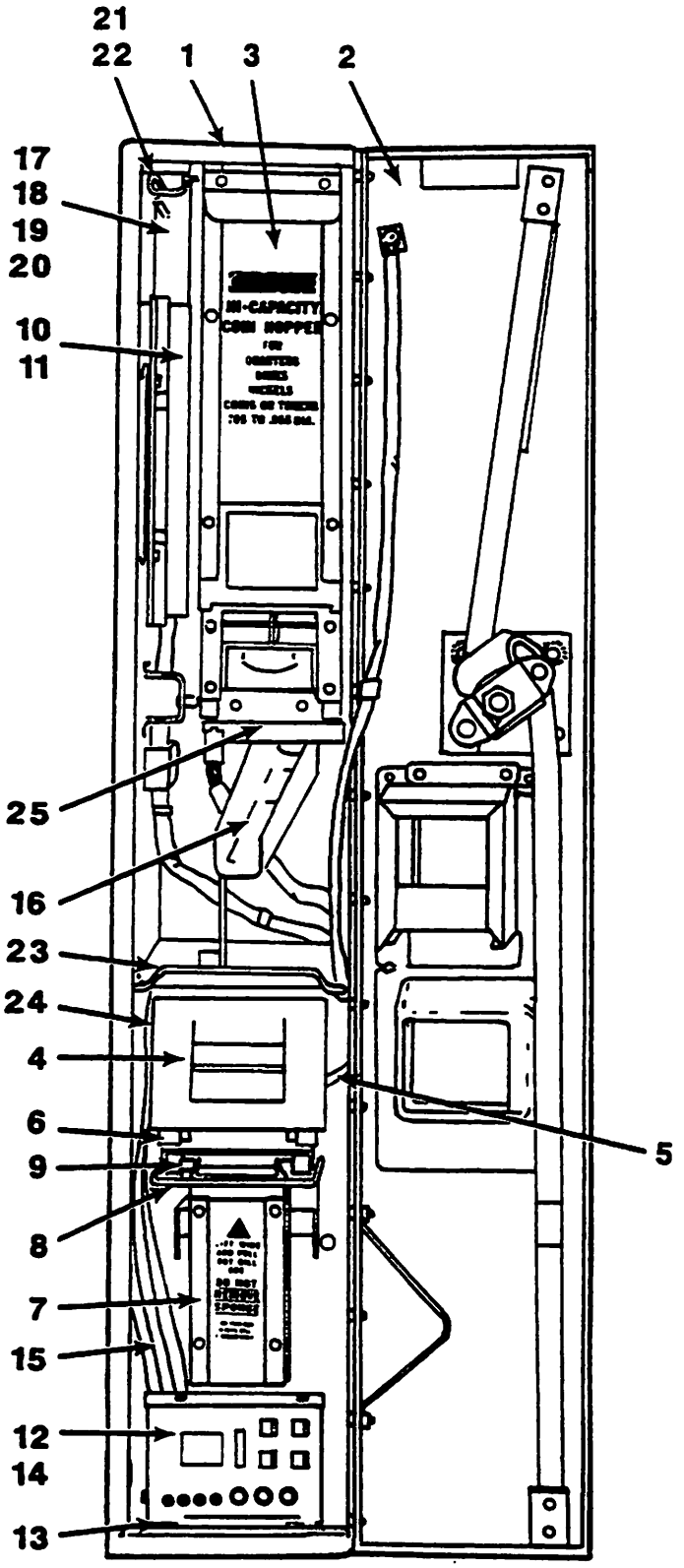
- Machine Model and Serial Number

- Complete shipping address, including the ZIP code

- Shipping Instructions must be supplied. If the shipping method is Parcel Post, Air Parcel Post, United Parcel Service, or Air UPS, and the packages may exceed the size and weight limits of these services, indicate an alternate shipping method.

If the shipment must be delivered as fast as possible, specify "Fastest Way". Rowe will select the carrier for orders that justify shipment by truck.

Figure 6-1. Bill Changer Assembly



Ref.	Part No.	Description	Qty
		BC-150 Bill Changer Assembly	
1	Ref.	• BC-150 Cabinet Assembly	1
	25238405	• • IBM Black[1]	
	65065502	• • • Cabinet Weld Assembly (IBM Black)	
2	Ref.	• Door Assembly *(see figure 6-2)*	1
3	Ref.	• Hi-Capacity Hopper Assembly *(see figure 6-8)*	1
	65027608	• • Nickel, Dime, and Quarter Hopper	As Ordered
	65027609	• • Quarter, Dollar Coins, and Token Hopper	As Ordered
4	65068501	• Bill Acceptor Transport Assembly *(see figure 6-3)*	1
5	35118802	• Transport Harness	1
6	65024908	• Bill Stacker Assembly *(see figure 6-9)*	1
7	45034601	• Bill Box Assembly	1
8	25095801	• Bill Box Catch	1
9	45033901	• Cash Box Guide	2
10	65069002	• Changer Control Computer Assembly *(see figure 6-5)*	1
11	70093401	• Cable Clamp - 17/32 (Not Shown)	3
	27023902	• Hopper Brush (Not Shown)	1
12	65073501	• Power Control Center *(see figure 6-4)*	1
13	25239001	• Power Control Center Mounting Bracket	1
14	70093403	• Cable Clamp - 1" (Not Shown)	1
15	65067902	• Main Harness Assembly	1
16	35065805	• Chute Assembly - Coin Cup	1
17	35070402	• Junction Box Cover Assembly	1
18	25152715	• Filter And Lug Assembly	1
19	70232301	• Strain relief - Right Angle	1
20	25078403	• Cord and Plug Assembly	1
21	45075901	• Hopper Retainer Bail	1
22	25181701	• Tension Spring	1
23	45075701	• Stop Rod	1
24	35023307	• Bill Acceptor Mounting Bracket	2
25	65058013	• Coin Dispenser *(see figure 6-6)*	1

The following parts are shipped in a plastic bag:

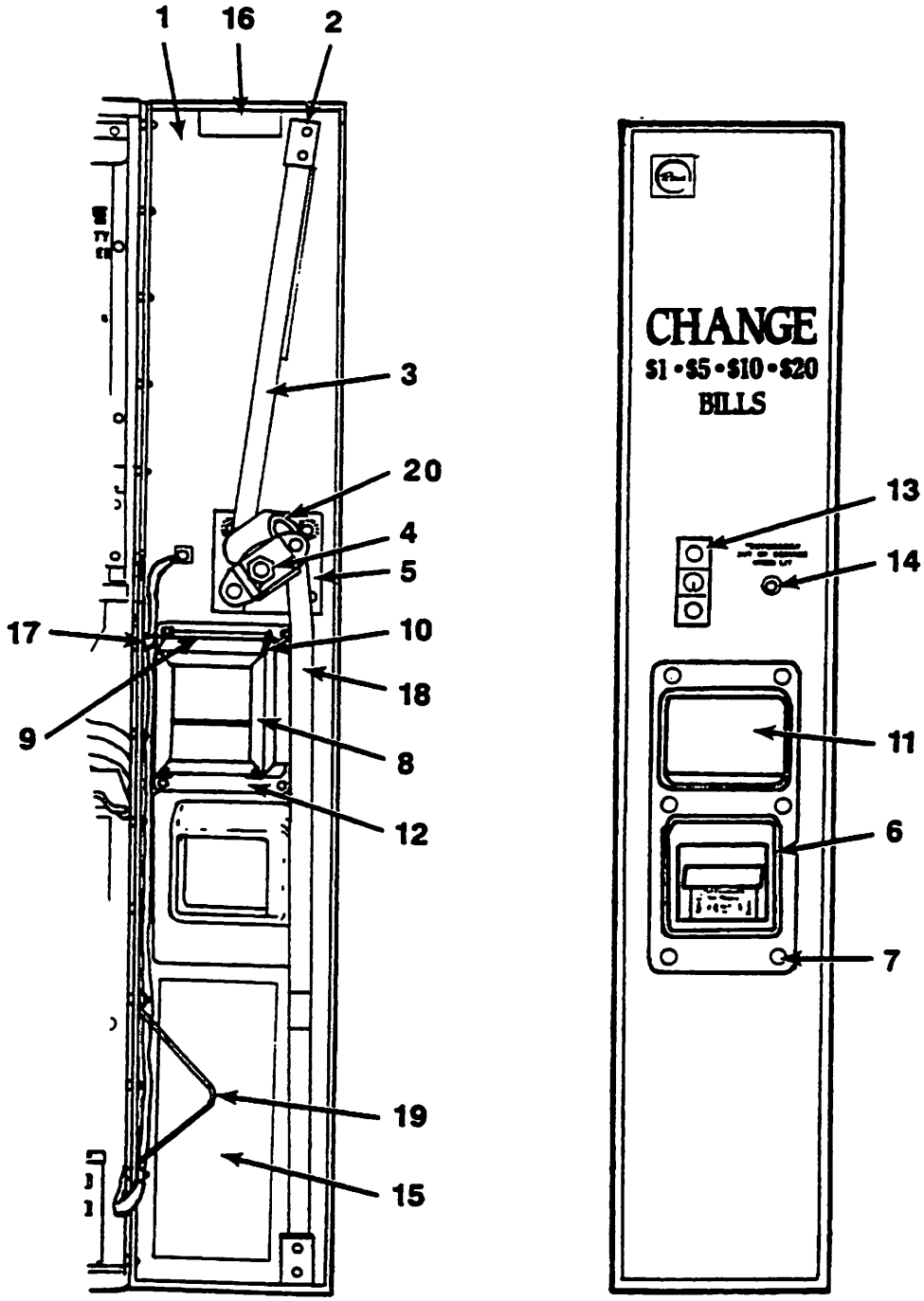
25168805	• Shoulder Screw (¼-20 SQHD, Not Shown)	4
89954004	• Drive Screw (#10 X ¼)	4
25030901	• Warning Label	1
70121408	• Spacer	4
87835700	• Hex. MS Nut (¼-20)	4
25165802	• Hopper Identification Label	1

Optional Accessory Kit

45078601	• Slide Mount Kit

[1] The second level cabinet (indicated by • •) is the complete cabinet with door (but no lock cylinder). The third level (indicated by • • •) is the painted cabinet without hardware or door.

Figure 6-2. Door Assembly



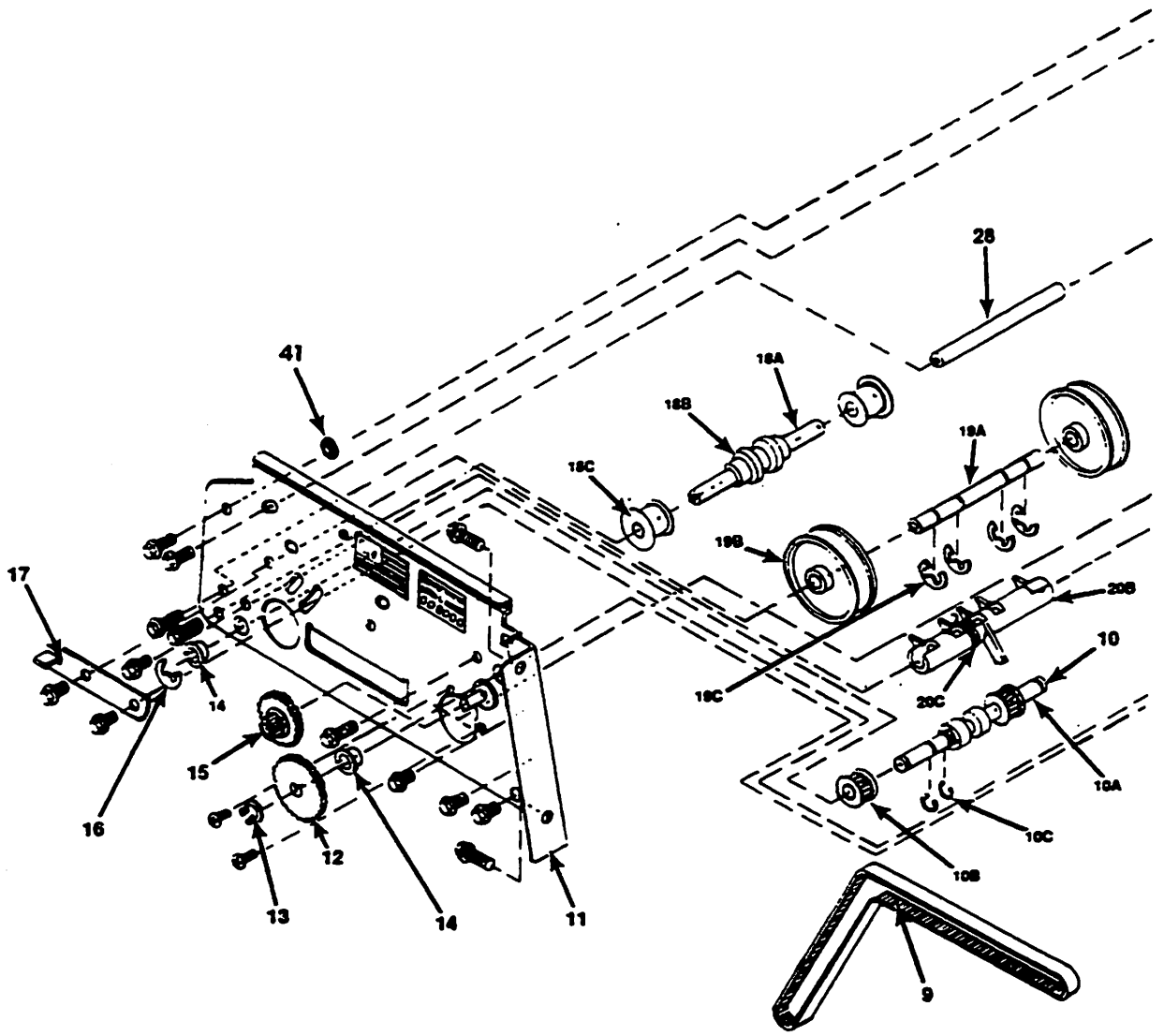
Ref.	Part No.	Description	Qty
1	Ref.	Door Assembly	1
	65068405	• Black[1]	
	65068305	• • Door Weld Assembly (Black)[2]	
2	25224901	• Spring- Flat (Lockbar)	2
3	35027711	• Lockbar Assembly	1
	35025506	• • Lock Lever and Bracket Assembly	1
	25045301	• • Lock Bar Stud	2
	70110114	• • Drive Pin (¼ X ½)	1
	35024015	• • Door Lock Bar - Long	1
	35024014	• • Door Lock Bar - Short	1
4	21357815	• Nut - Elastic Stop (½-13 UNC)	1
5	35068302	• Lock Plate	1
6	45048008	• Trim - Bill Acceptor & Coin Cup	1
7	70134121	• Screw - Special (¼-20 Carriage)	6
8	45074302	• Cup Assembly - Coin	1
9	25239701	• Coin Cup Door Shaft	1
10	25181701	• Tension Spring	1
11	35116902	• Door - Change Cup	1
12	35121501	• Coin Cup Mounting Bracket	2
13	35027806	• T-Handle Assembly (Chicago Lock)	1
14	25191301	• Light - Indicator	1
15	45048908	• Label - Service	1
16	25190006	• Pad - Sponge Rubber	1
17	70093103	• Clamp - Cable (¼ inch)	1
18	25064401	• Spring - Tension (Behind Lock Bar)	1
19	25111202	• Push Bar (Cash Box)	1
20	25164401	• Spring Strap	1

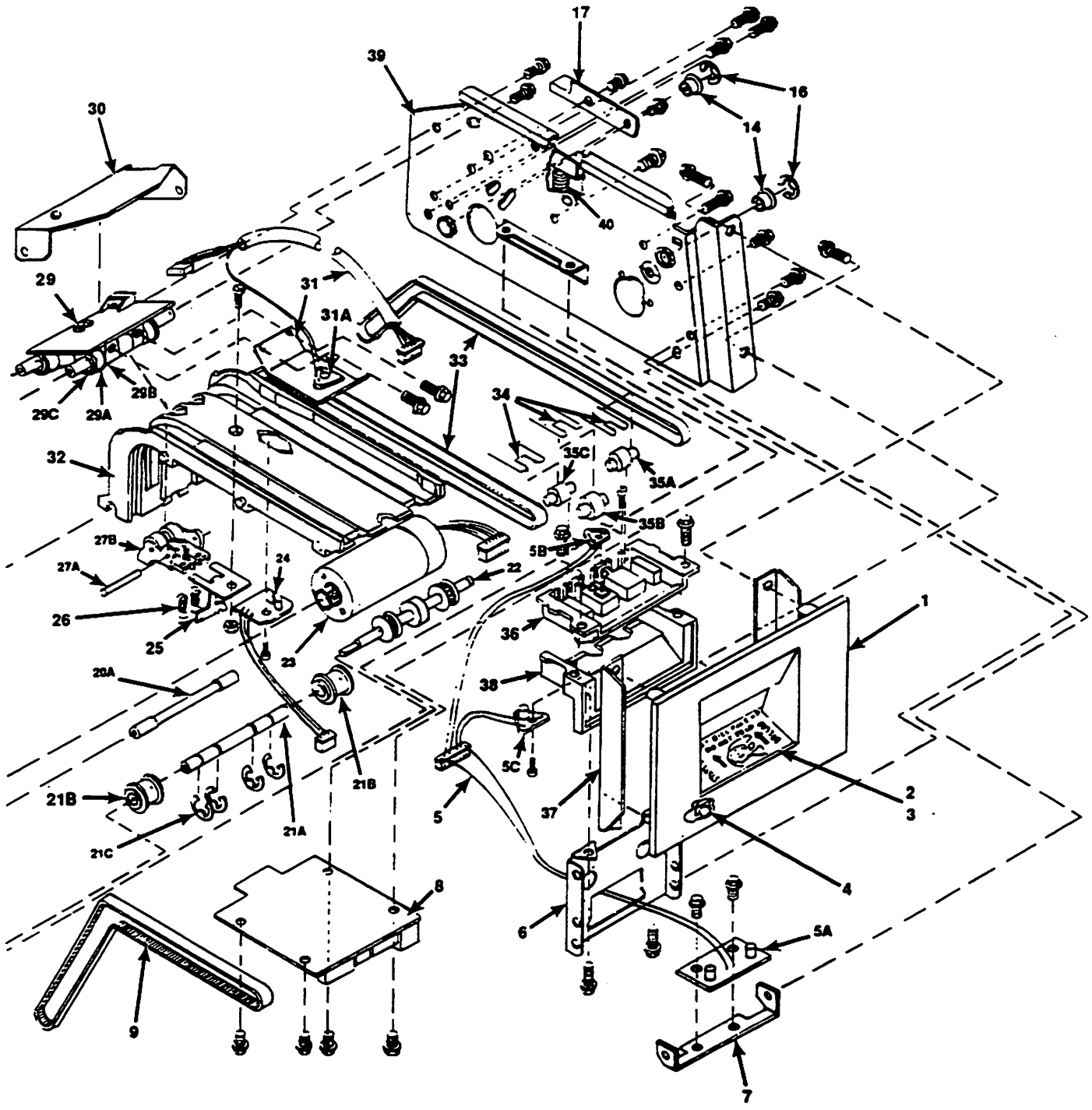
[1] Order 65068405 for the completed door assembly with hardware.

[2] Order 65068305 for the painted door only (no hardware).

Figure 6-3. BA-50 Bill Acceptor Assembly

(Corresponding Parts List On Page 6-10)




17
39
16
14
30
40
29
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31A
33
34
29C
29A
29B
32
35C
35A
35B
27B
27A
24
22
5B
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25
23
36
1
20A
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5C
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21B
21A
21B
21C
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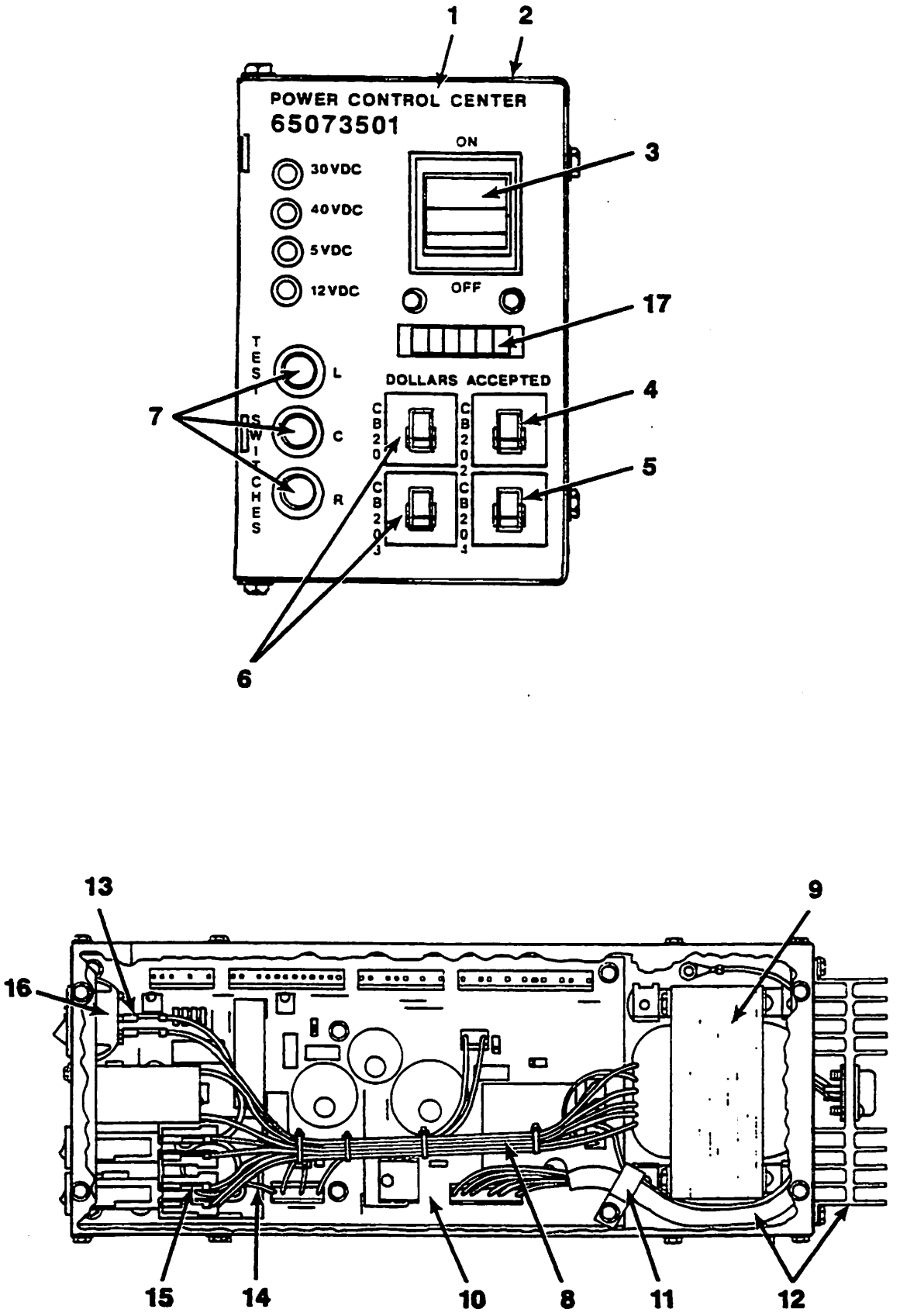
5A
9
7

Figure 6-3. BA-50 Assembly, Sheet 1 of 2

Ref.	Part No.	Description	Qty
	65068501	BA-50 Bill Acceptor	
1	65022401	• Trim - Front (Bill Acceptor)	1
2	30622102	• Window - Clear	1
3	35118901	• Insert - Window	1
4	21384701	• Retainer - Window	1
5	45073201	• Harness and Board Assembly with Inlet and LED's	1
A	35119201	• • Circuit Board (With LED's)	1
B	25236302	• • Photo Cell (Only)	1
C	70035314	• • LED (Only)	2
6	25076501	• Bracket - Support	1
7	35119101	• Bracket - Legend Window	1
8	45073001	• Circuit Board Assembly - Interconnect	1
9	35082005	• Belt - Timing	2
10	35114501	• Shaft and Pulley Assembly	1
A	35113501	• • Shaft - Pulley with Rollers	1
B	25192902	• • Pulley - Timing (22 Tooth)	2
C	70143301	• • Ring - External Retaining	2
11	35036003	• Plate Assembly - Side (LH)	1
12	35114401	• Gear - Drive	1
13	70143801	• External Retaining Ring	1
14	70146004	• Bearing - Nyliner	4
15	B0031936	• Gear Reduction	1
16	70143004	• Ring - External Retaining	3
17	25194102	• Bracket - Takeup	2
18	Ref.	Components:	
A	25193402	• Shaft - Crowned Pulley	1
B	25238902	• Roller - Output (With Coupling)	1
C	25193605	• Roller Creasing (With Coupling)	2
19	Ref.	Components:	
A	35080003	• Shaft - Pulley	1
B	35080101	• Pulley - Drum	2
C	70143004	• Ring - External Retaining	4
20	Ref.	Components:	
A	25193403	• Shaft - Anti Cheat Lever	1
B	35096403	• Lever - Anti Cheat	1
C	35081601	• Spring Torsion	1
21	Ref.	Components:	
A	35080003	• Shaft - Pulley	1
B	35080301	• Roller - Takeup	2
C	70143004	• Ring - External Retaining	4
22	35113601	• Shaft Assembly - Drive	1
23	45058408	• Motor Assembly with Encoder	1
24	45058205	• Harness and Board Assembly - Lower Reflector	1
	70035314	• • LED	1
	25236302	• • Photoconductive Cell	1
	25194803	• • Mounting Pad (TO18)	1
25	35114001	• Bracket - Spring	1
26	25225003	• Spring - Tension	2
27	Ref.	Components:	
A	25191702	• Pin-Pivot	1
B	35080604	• Roller Assembly-Pressure	2
28	25193402	• Shaft - Crowned Pulley	1

Ref.	Part No.	Description	Qty
29	45073101	• Head and Holder Assembly	1
A	25193301	• • Roller - Crowned	4
B	70120915	• • Washer	4
C	70143004	• • Ring - External Retaining	4
30	35120201	• Cover - Mag. Amp (With Insulator)	1
31	35118501	• Harness and Bracket Assembly - Mag. Amp	1
A	25236302	• • Photoconductive Cell	1
32	65067101	• Track Lower	1
33	35114901	• Belt - Drive (Upper)	2
34	21342702	• Spring - Retaining (Roller)	3
35	Ref.	Components:	
A	25235001	• Shaft - Roller	3
B	25193902	• Roller - Idler (Input)	1
C	25193301	• Roller - Crowned	2
36	65067501	• Inlet - Bill (Upper)	1
37	25060101	• Bracket Side Shield	2
38	65067601	• Inlet Bill (Lower)	1
39	35035209	• Plate Assembly - Side (RH)	1
40	21398501	• Spring - Tension	1
41	20922510	• Spacer	1

Figure 6-4. Power Control Center Assembly



Ref.	Part No.	Description	Qty
	65073501	Power Control Center Assembly	
1	45075801	• Box Assembly-Power Control	1
2	45075501	• Power Control Box Cover Assembly	1
3	30785701	• Rocker Switch (SPST)	1
4	70073605	• Circuit Breaker 2 Amp (CB202)	1
5	70073608	• Circuit Breaker 5 Amp (CB204)	1
6	70073610	• Circuit Breaker 7 Amp (CB201, CB203)	2
7	21638002	• Switch Cap	3
8	35120301	• Power Control Harness Assembly	1
9	45049505	• Power Transformer Assembly	1
10	65069701	• Circuit Board Assembly - Power Supply *(see Schematic and Components List in Section 4)*	1
11	70093401	• Cable Clamp (17/32)	1
12	35119701	• Heatsink and Harness Assembly	1
	70030807	• • Transistor - Silicon Darlington	1
	70036514	• • Voltage Regulator	1
	21318902	• • Insulator	
	35119501	• • Heatsink and Socket Assembly	1
	35119601	• • Heatsink Harness Assembly	1
	70075601	• • • Post Contact	1
13	21621837	• Jumper Assembly (Black/Yellow)	1
14	21621836	• Jumper Assembly (Red/Yellow)	1
15	21621835	• Jumper Assembly (Yellow/Green)	1
16	21408602	• Receptacle-Straight	5
17	25065709	• Bills Accepted Counter Assembly	1
	21441802	• • Counter - Electric	1
	70075701	• • Keying Plug	1
	70075503	• • Connector Housing (3 Pin)	1

Figure 6-5. Changer Control Computer Assembly

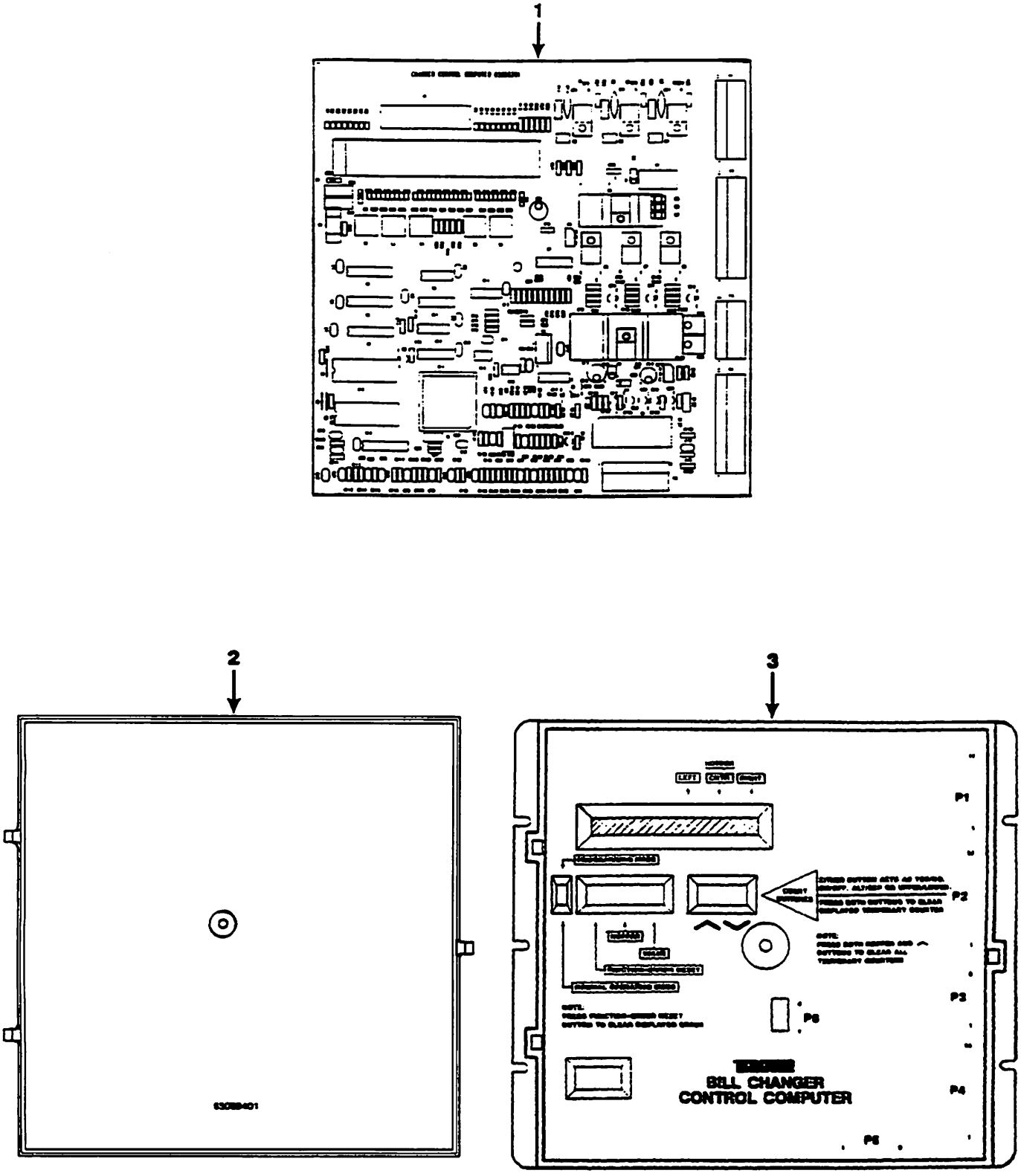
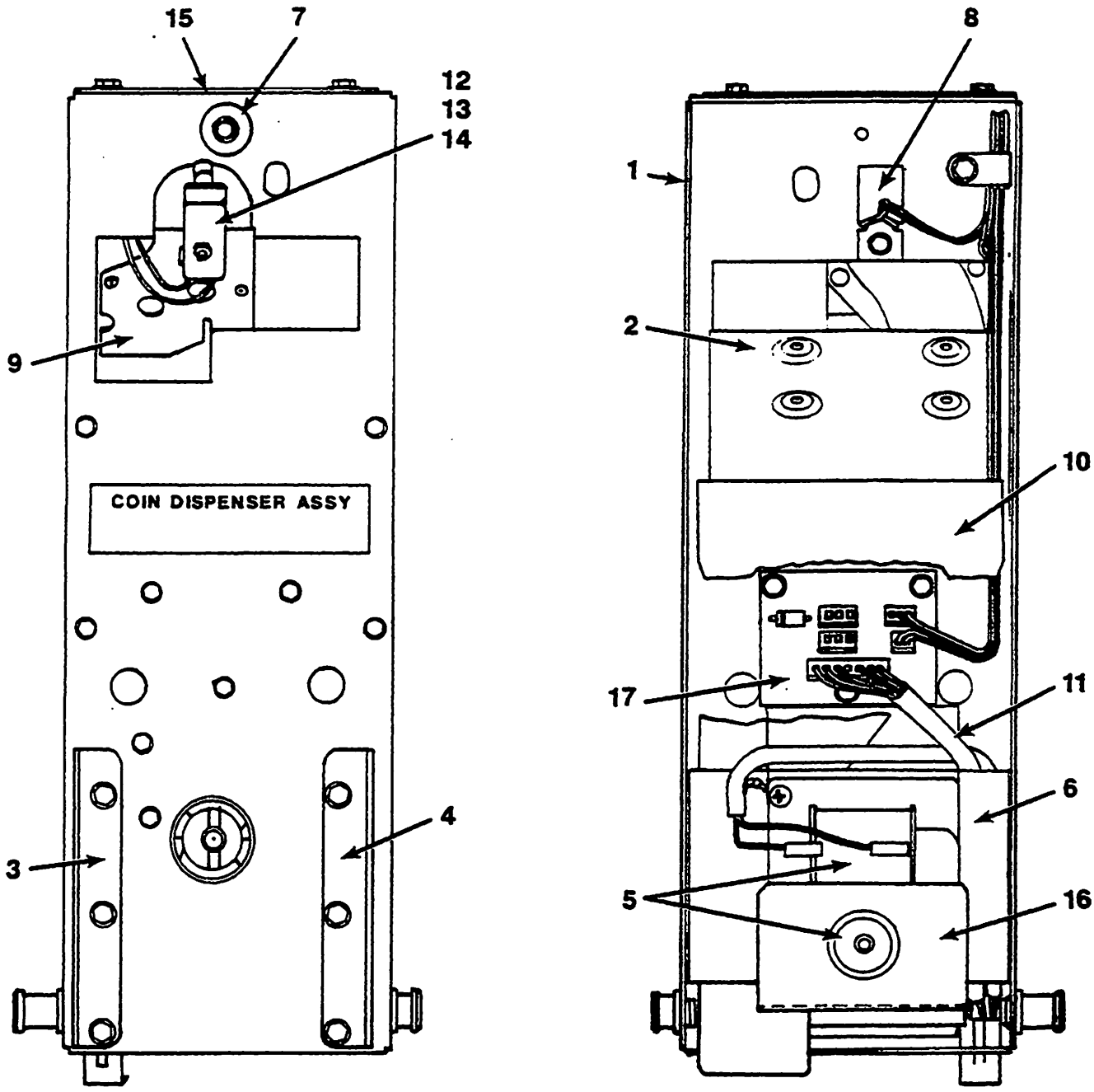


Figure 6-5. Changer Control Computer Assembly

Ref.	Part No.	Description	Qty
	65069002	Changer Control Computer Assembly	
1	65068202	• Changer Control Computer Board Assembly	1
		(see the schematic in Section 4 for components)	
2	65069401	• Base Cover Assembly	1
3	65069301	• Cover	1
	45060803	• Guide Plate (Not Shown)	1

Figure 6-6. Coin Dispenser Assembly



Ref.	Part No.	Description	Qty
	65058013	Dispenser Assembly	
1	45035310	• Frame and Pivot Assembly	1
2	45032617	• Bucket Assembly - Change *(see figure 6-7)*	1
3	35044702	• Bracket-Mounting (Hopper LH)	1
4	35044802	• Bracket-Mounting (Hopper RH)	1
5	45034102	• Hopper Drive Motor Assembly	1
	45034001	• Ratchet Coupling	1
	25097701	• Compression Spring	1
	25151101	• Extension Coupler - Shaft	1
6	45043601	• Bracket-Mounting (Motor)	1
7	25112701	• Bumper-Rubber	1
8	45076101	• Holder Assembly-LED	1
	70035315	• • LED	1
9	45035005	• Coin Chute Assembly - Hopper	1
10	35068203	• Chute Assembly	1
11	65065302	• Harness Assembly-Dispenser	1
12	25175702	• Photo Detector Board and Terminal Assembly	1
13	70121626	• Spacer (Nylon)	1
14	35048202	• Cover-Terminal Board	1
15	25151702	• Plate-Holddown	1
16	35098902	• Guard-Dispenser Motor	1
17	45076401	• Circuit Board Assembly-Interconnect	1

Figure 6-7. Change Bucket Assembly

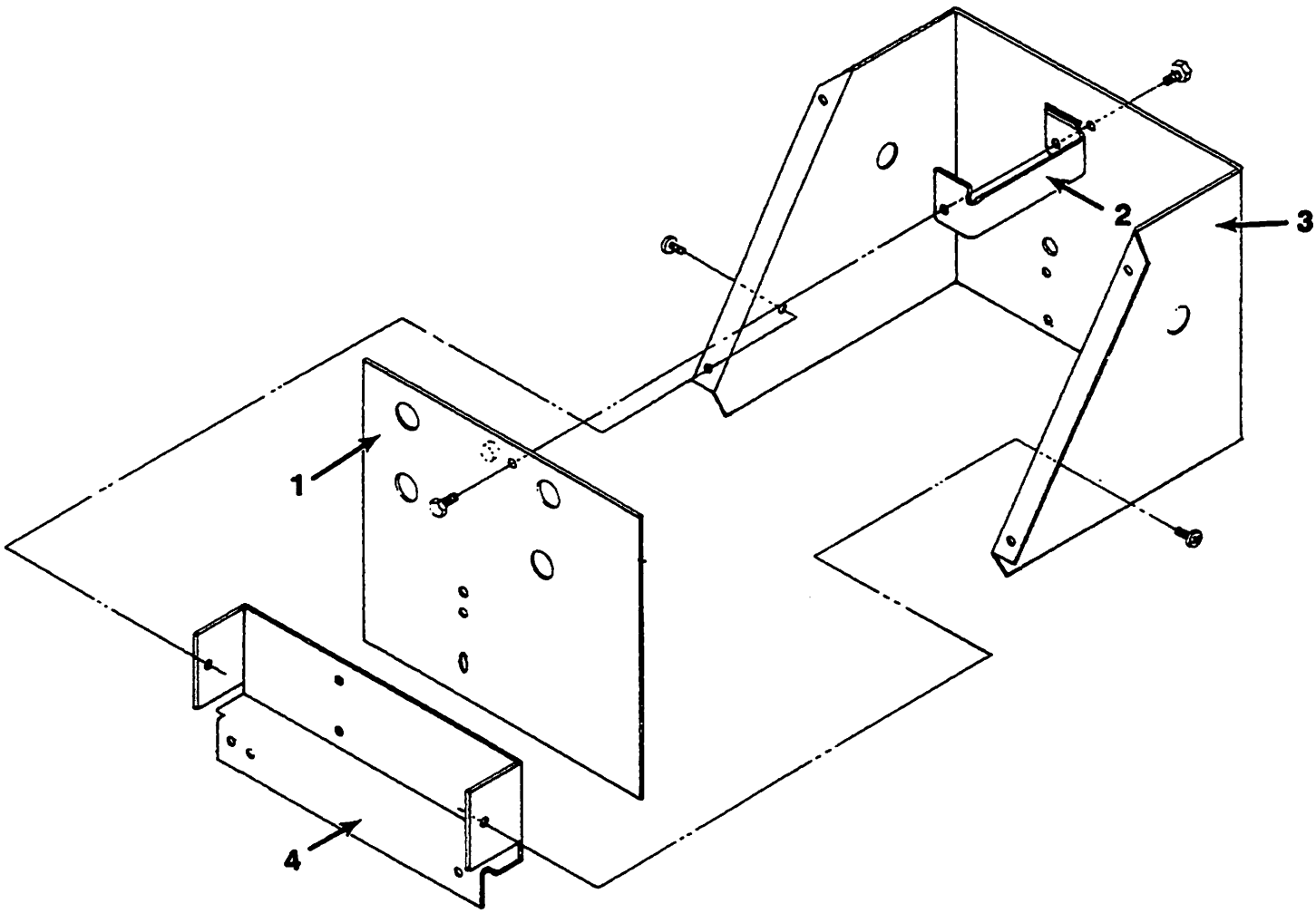
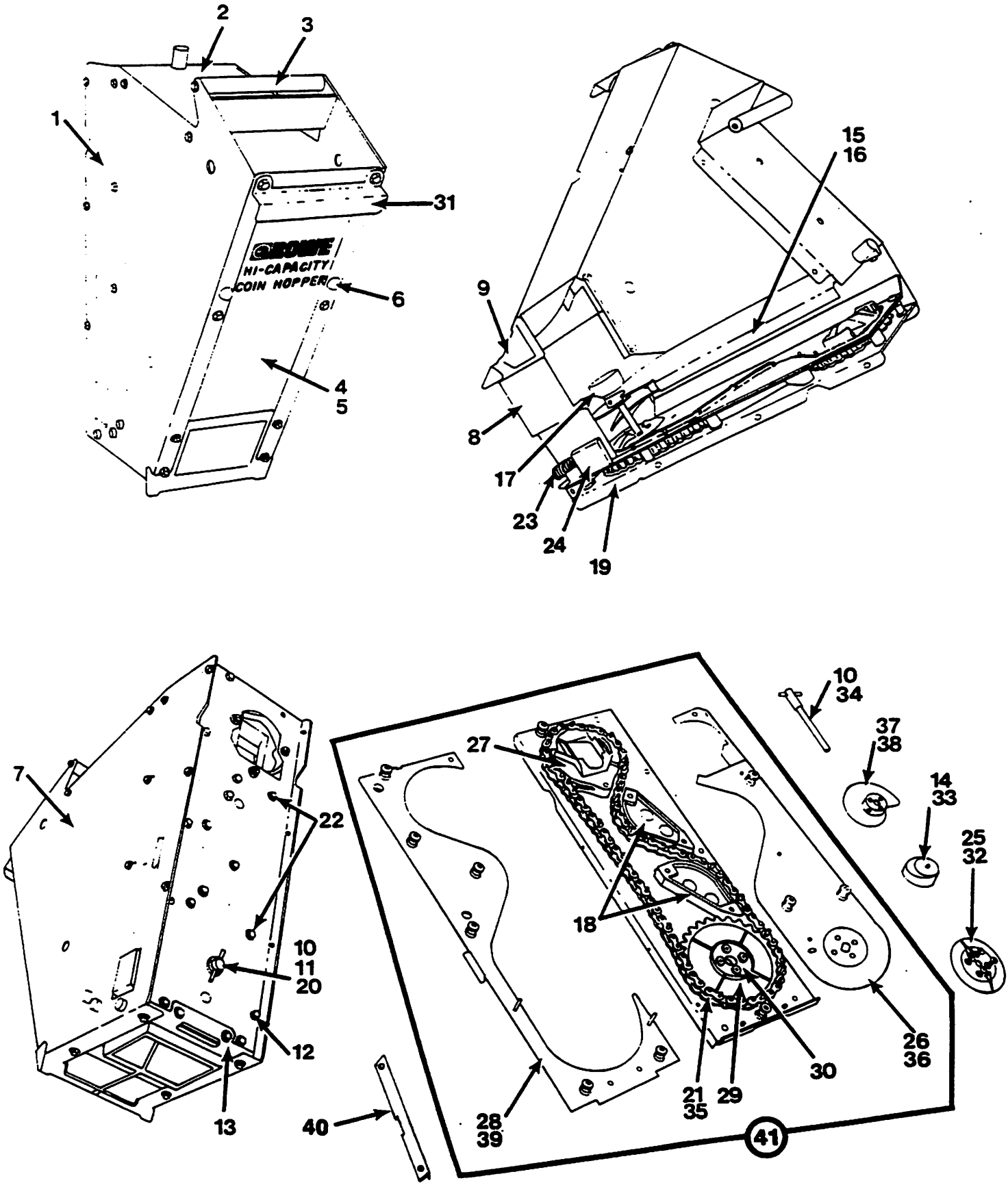


Figure 6-7. Change Bucket Assembly

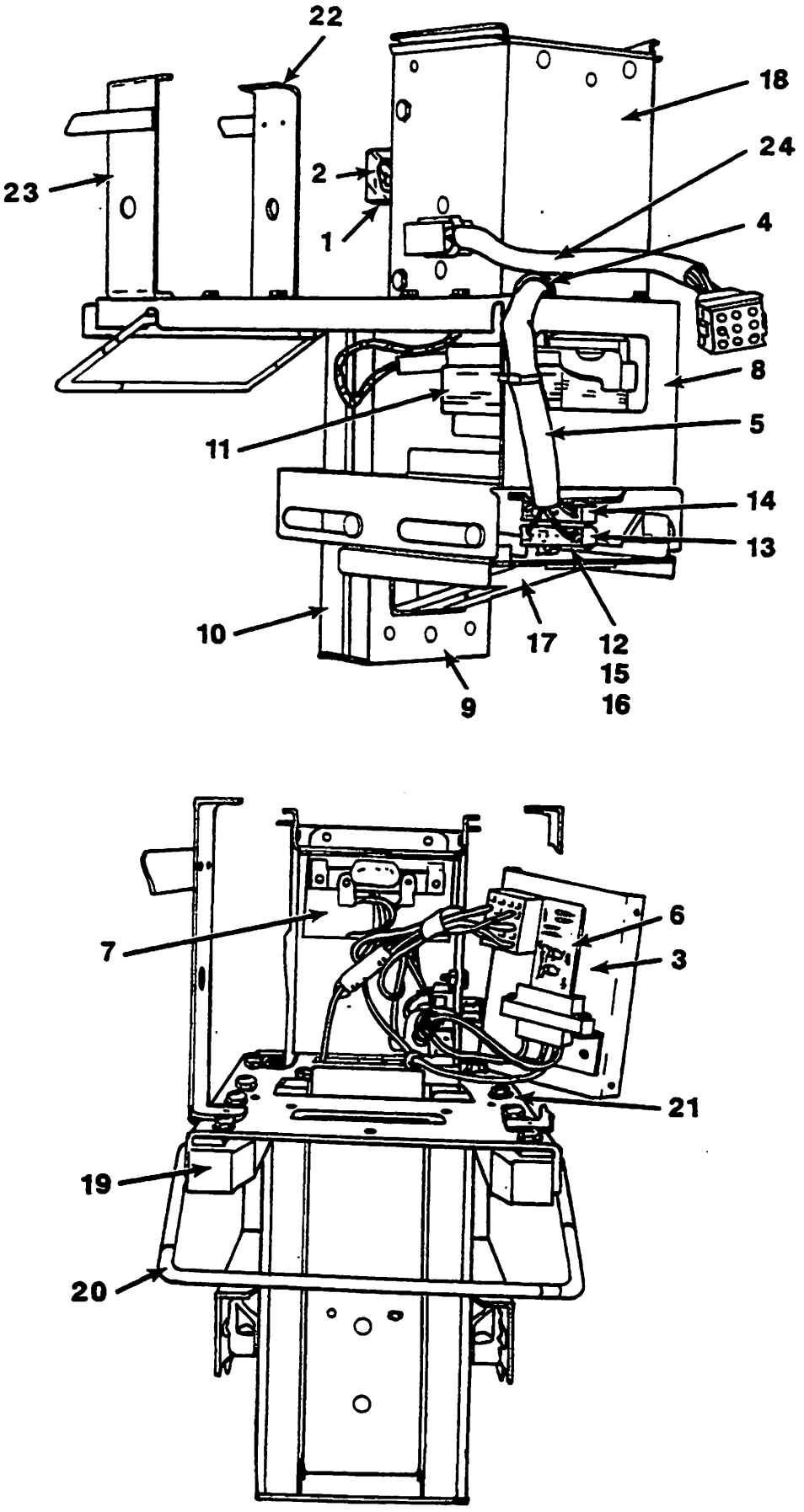
Ref.	Part No.	Description	Qty
	45032617	Bucket Assembly - Change	
1	35042003	• Front Plate Assembly	1
2	25112902	• Support Bracket	1
3	45033305	• Bucket Frame Assembly	1
4	25112403	• Coin Chute Mounting Bracket	1

Figure 6-8. Hi Capacity Hopper Assembly



Ref.	Part No.	Description	Qty
	65027608	Hi-Capacity Hopper Assembly (Small Coins)	Ref.
	65027609	Hi-Capacity Hopper Assembly (Large Coins)	Ref.
1	45032402	• L.H. Side Assembly	1
2	35074201	• Top Assembly	1
3	25098101	• Coin Handle	1
4	35044608	• Front Cover Small Coins (Small Coins)	1
5	35044609	• Front Cover Large Coins (Large Coins)	1
6	25114701	• Bumper	2
7	45032503	• R.H. Side Assembly	1
8	65027902	• Fixed Funnel (Intermediate)	1
9	65027901	• Fixed Funnel	1
10	25113701	• Drive Shaft and Pin Assembly (Small Coins)	1
11	70120903	• Washer	1
12	70121624	• Spacer	2
13	35048801	• Tie Bracket	1
14	35058101	• Agitator Cam (Small Coins)	1
15	45072101	• Coin Baffle and Stud Assembly (Small Coins)	1
	25224501	• • Baffle and Bracket Assembly	1
16	45072102	• Coin Baffle and Stud Assembly (Large Coins)	1
	25224501	• • Baffle and Bracket Assembly	1
17	70146006	• Nylon Bearing	1
18	35048501	• Chain Guide	2
19	35060501	• Plate and Post Assembly	1
20	70146021	• Nylon Bearing	1
21	35043703	• Extended Pin Chain (Small Coins)	1
22	70134109	• Special Screw (Black)	2
23	25113401	• Compression Spring	2
24	65028202	• Sliding Funnel	1
25	45034205	• Agitator (Small Coins)	1
26	35044502	• Inner Coin Guide Assembly (Small Coins)	1
27	65028803	• Chain Guide Ring	1
28	45031902	• Outer Coin Slide Assembly (Small Coins)	1
29	45035601	• Sprocket	1
30	35047101	• Drive Spacer	1
31	25165902	• Hopper Handle	1
32	45034204	• Agitator (Large Coins)	1
33	35058102	• Agitator Cam (Large Coins)	1
34	25113702	• Drive Shaft and Pin Assembly (Large Coins)	1
35	35043705	• Extended Pin Chain (Large Coins)	1
36	35044504	• Inner Coin Guide (Large Coins)	1
37	25171202	• Upper Agitator Assembly (Large Coins)	1
38	70113013	• Roll Pin (Large Coins)	1
39	45031903	• Outer Coin Slide Assembly (Large Coins)	1
40	25226901	• Coin Ramp (Large Coins Only)	1
41	REF.	• This assembly, including items 26, 28, 36, and 39, is available as a replacement part as follows:	
	47000601	• • Coin And Chain Guide Assembly (Small Coins)	1
	47000602	• • Coin And Chain Guide Assembly (Large Coins)	1

Figure 6-9. Bill Stacker Assembly



Ref.	Part No.	Description	Qty
	65024908	Bill Stacker Assembly	
1	21275101	• Relay	1
2	21286901	• Spring-Relay Retaining	1
3	25111502	• Cover-Box	1
4	70233206	• Bushing-Snap (Split)	1
5	45031102	• Harness Assembly-Bill Stacker	1
6	30752701	• Circuit Board Assembly-Driver	1
7	21772802	• Insulator-Capacitor	1
8	45030501	• Bracket Assembly-Motor	1
9	35038601	• • Chute-Bill	1
10	35039301	• • Edge-Chute	2
11	35039601	• • Motor and Pin Assembly	1
12	25229201	• • Bracket and Switch Assembly	1
13	21073201	• • • Switch (NC)	1
14	21073101	• • • Switch	1
15	21082901	• • • Actuator-Switch	2
16	25054801	• • • • Insulator-Switch	1
17	45030201	• • Carriage Assembly	1
18	35048003	• • Box Assembly-Electrical	1
19	45033901	• • Guide-Cash Box	2
20	25095801	• • Catch-Cash Box	1
	45034601	• • Box Assembly-Cash *(Not Shown, see figure 6-1, item 7)*	1
	35039204	• • • Plate-Pressure	1
	25096101	• • • Block-Foam	1
21	45030901	• • Frame-Bill Stacker	1
22	35065901	• • Strap and Stop Assembly-LH	1
23	35066002	• • Strap & Stop Assembly-RH	1
24	35077301	• • Harness Assembly-Single Stacker	1

27035901	Hopper Baffle Kit, Hi Capacity (Quarters, Dimes, Nickels)
27035902	Hopper Baffle Kit, Hi Capacity ($1 Coin)
27029902	Hopper Motor Brake Lever Assembly
27020302	Motor Armature Assembly (Multi-Products)
27023302	Motor Brake Pawl (Multi-Products)
27039701	Slide Mount Kit
47000601	Coin and Chain Guide Assembly
47000602	Coin and Chain Guide Assembly
27031501	Armor Plate Kit
27033202	Hopper Conversion Kit
27034602	Door Guard Kit
35087214-23	Base Kit
35087414-23	Top Filler Kit
35087514-23	Bank Kit (Includes base and filler)
35087524	Bank Kit - Genesis Styling